

INFORMATION SYSTEMS
1988 PLANNING REPORT

INPUT

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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Continuous-information advisory services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services (software, processing services, turnkey systems, systems integration, professional services, communications, systems/software maintenance and support).

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Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

INPUT OFFICES

North America

Headquarters

1280 Villa Street
Mountain View, CA 94041
(415) 961-3300
Telex 171407 Fax (415) 961-3966

New York

Parsippany Place Corp. Center
Suite 201
959 Route 46 East
Parsippany, NJ 07054
(201) 299-6999
Telex 134630 Fax (201) 263-8341

Washington, D.C.

8298 C, Old Courthouse Rd.
Vienna, VA 22180
(703) 847-6870 Fax (703) 847-6872

International

Europe

INPUT LTD.

Piccadilly House
33/37 Regent Street
London SW1Y 4NF, England
01-493-9335
Telex 27113 Fax 01-629-0179

INPUT s.a.r.l.

29 rue de Leningrad
75008 Paris, France
01-44-80-48-43
Fax 01-44-80-40-23

Japan

FKI, Future Knowledge Institute
Saida Building,
4-6, Kanda Sakuma-cho
Chiyoda-ku,
Tokyo 101, Japan
03-864-4026 Fax 001-03-864-4114

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Information Systems Program (ISP)

Information Systems Planning Report

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Abstract

INPUT's 1988 Information Systems Planning Report documents the continuing focus on expenditure levels, the use of internal and external resources, the search for a strategic role for IS, and the continued exploration of the expanding wealth of technologies available to today's organization. This report is the culmination of over 600 interviews and extensive additional research.

The report describes the driving forces and major issues facing information systems; provides an assessment of the application development environment, an analysis of the information systems budget, and a look at future technology planning; and sets priorities for 1989 and beyond.

Planning and implementing information-technology-based solutions has never been as challenging as it is today. INPUT's goal through this report and its Information Systems Program is to help information systems management successfully meet this challenge. The report contains 106 pages and 59 exhibits.



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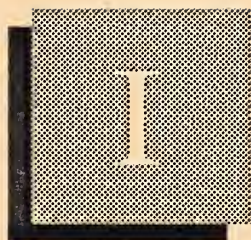
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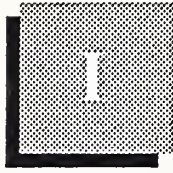
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Introduction





Introduction

A

Overview

The annual Information Systems Planning Report draws on all of INPUT's research into the information systems arena. Throughout the year INPUT surveys hundreds of information systems managers to determine the issues, trends, challenges, and responses facing and being used to direct the deployment of information technology within large organizations (both industrial and governmental).

The challenge facing the Information Systems (IS) profession has never been greater than it is as the 1980s draw to a close. The speed with which new technology is available continues to increase and the pressure to use information technology for business improvement has become immense.

Currently Information Systems suffers from technology overload and the challenge to become a driving force for competitive advantage within the organization it serves. The alternatives and demands are numerous, creating a priority crisis. The roadmap to success is based on careful selection of the most important priorities and execution with much greater speed than IS has demonstrated in the past.

This report is designed to help IS management understand and select those priorities and to provide the framework needed to develop a solid information systems plan and program.

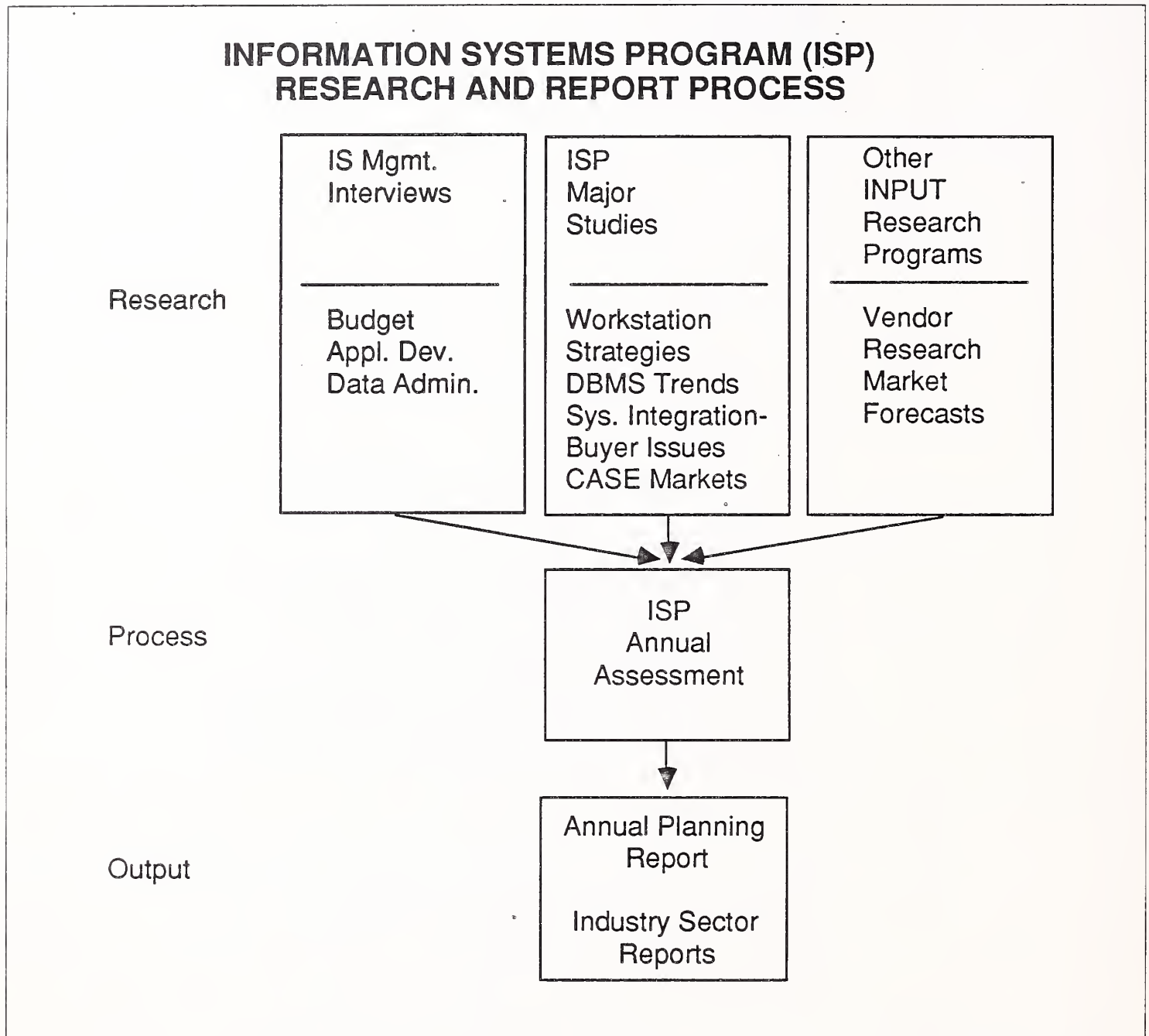
B

Research Methodology

The annual Information Systems Planning Report draws on research from a number of sources as depicted in Exhibit I-1.

Of critical importance are the interviews each year with IS management. During 1988, INPUT conducted more than 400 in-depth interviews using structured questionnaires. Those interviews are summarized in Exhibit

EXHIBIT I-1



I-2 and described below. The three principal questionnaires are also included in the Appendixes.

1. Budget and Issues

These interviews are the primary source of budget, issues, and trend data. They were conducted with the head of Information Systems or a senior staff member.

2. Application Development

These interviews were conducted with the Manager of Applications Development within large (Fortune 500) corporations and provided data for a report on Computer-Assisted Systems Engineering (CASE) and Chapter V.

3. Data Administration

One hundred interviews were conducted with managers of data administration within large organizations to support a report on trends in the data management process. The findings are used to highlight the changes required by data management to support the move to relational data base technology.

4. Major Issue Studies

For each "issue study" INPUT interviewed 30 to 100 user organizations as part of its research. Besides the interviews listed above, INPUT conducted issue study interviews on the use of CASE technology, systems integration, workstation strategies, and relational data base deployment.

EXHIBIT I-2

INFORMATION SYSTEMS PLANNING REPORT 1988 RESEARCH ACTIVITY

| Questionnaire | No. Interviews | No. Industries |
|-------------------------|----------------|----------------|
| Budget & Issues | 211 | 15 |
| Application Development | 103 | 12 |
| Data Administration | 100 | 11 |
| Issues Studies | 200 | NA |

C

Research
Demographics

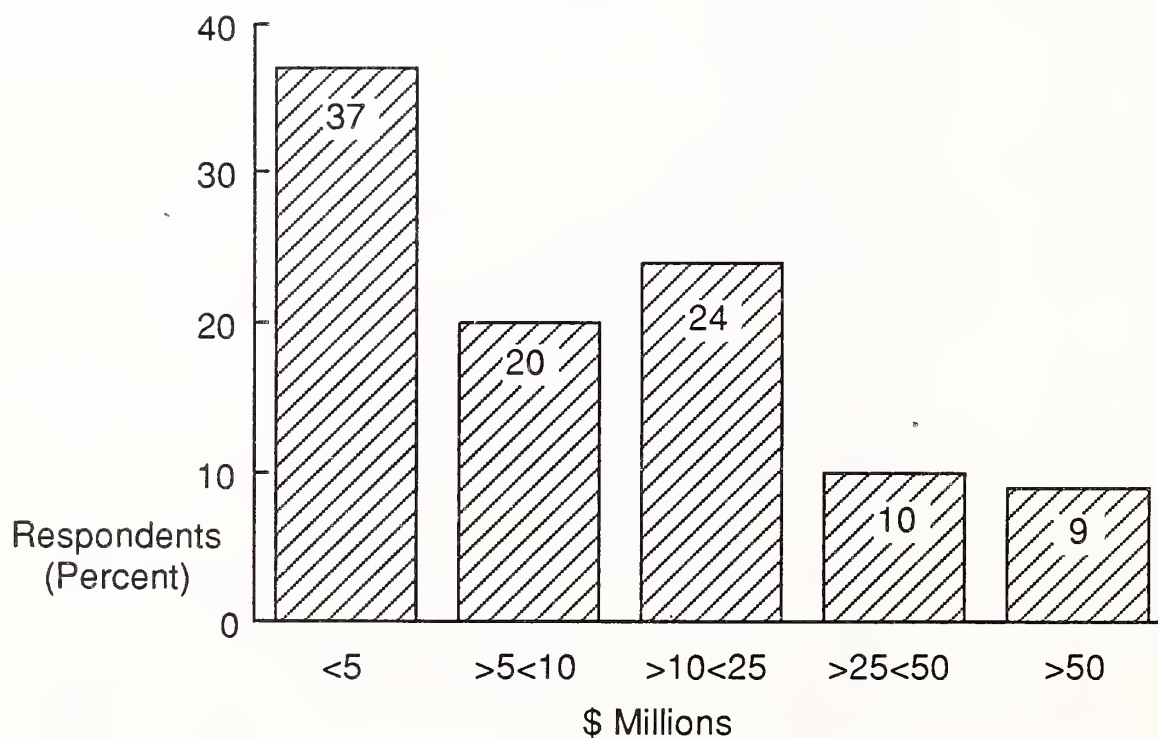
The principal research supporting this report is the Budget and Issue survey. The demographics of those 200-plus responding organizations are described below. *This survey is the source of the statistical findings in the report unless noted otherwise.*

Exhibits I-3, I-4 and I-5 describe the organizations interviewed.

1. Size of Information Systems Budget

The budgets ranged from under \$5 million (37% of those surveyed) to over \$100 million, with 9% over \$50 million.

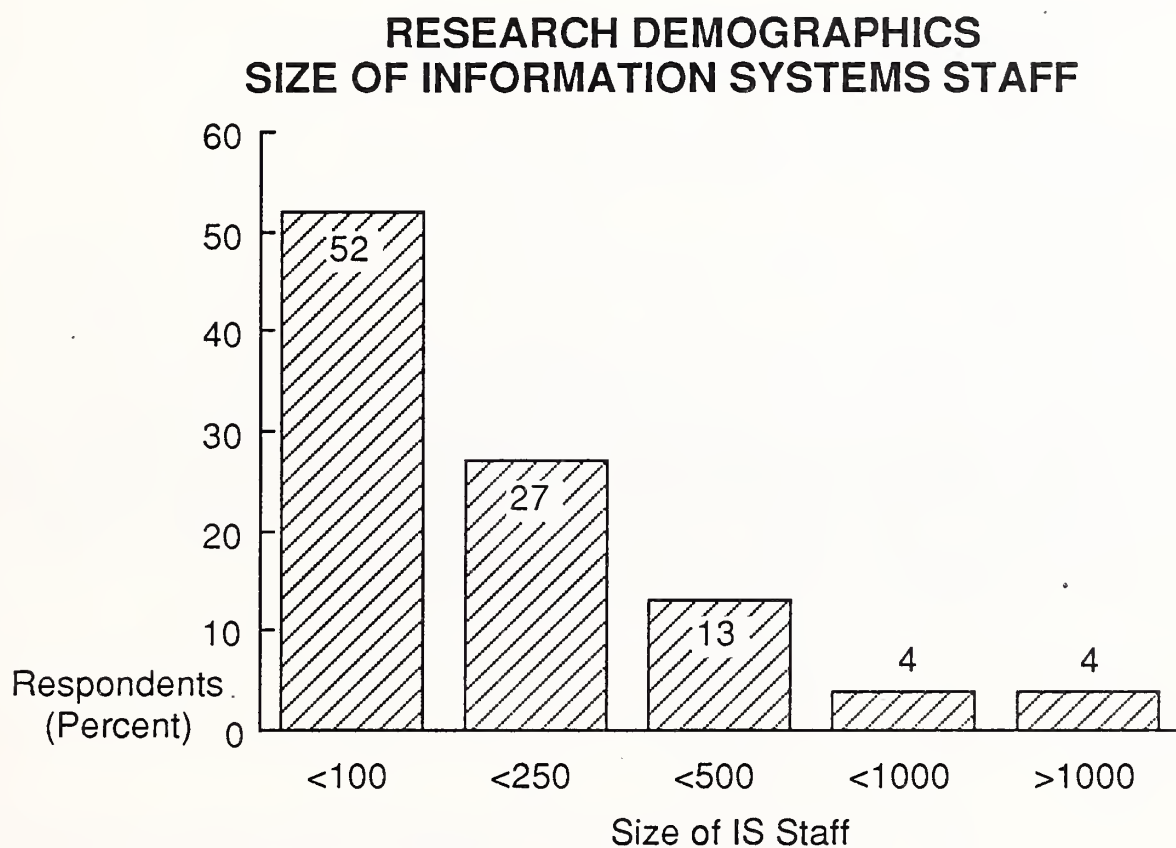
EXHIBIT I-3

**RESEARCH DEMOGRAPHICS
SIZE OF INFORMATION SYSTEMS BUDGET
1988**

2. Size of Information Systems Staff

The Information Systems staff size ranged from less than 100 to more than 1,000 employees. 25% of the sample indicated that their IS organization was decentralized.

EXHIBIT I-4

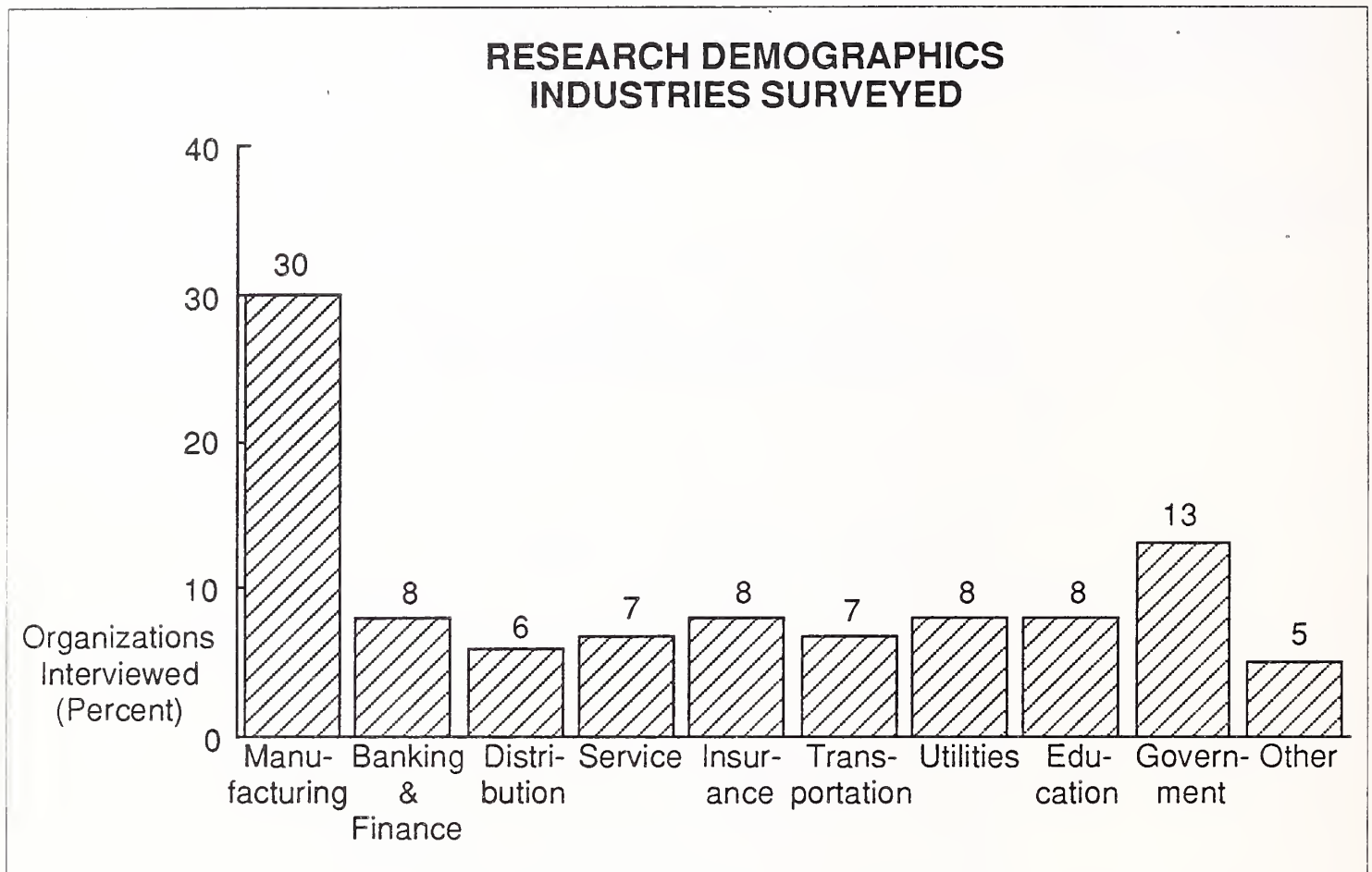


3. Industries Surveyed

The survey population included all of the standard industry categories.

This report includes the following chapters.

EXHIBIT I-5

**D****Report Structure**

- I Introduction.
- II Executive Overview: A summary of the entire report with key findings.
- III Driving Forces: A review of the factors external to the information systems function that are most directly impacting IS.
- IV Major Issues: A discussion of those issues facing IS that INPUT believes must receive top priority from IS management.
- V Application Development Trends: An in-depth look at the issues, trends, and challenges facing the internal applications development function.
- VI Information Systems Budget: INPUT's findings about spending trends and budget management within the IS function.

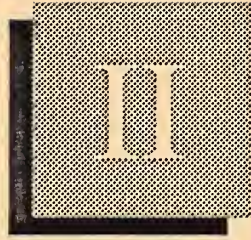
- VII Impact of New Technology: A review of the new technologies IS is considering for future deployment.
- VIII Conclusions and Recommendations: INPUT's recommendations of priorities for IS management in 1989 and beyond.

E

Related Reports

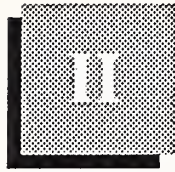
This report draws on the findings of numerous INPUT research studies published over the last two years. Of direct interest are the following.

1. *Information Systems Planning Report, 1987*
2. *Information Systems Industry Sector Reports* (A review of information systems and information services market trends unique to each of 15 vertical industries).
3. *Information Services Industry Report, 1987*
4. *Workstations Strategies* (A four report series)
5. *CASE Markets, 1988-1993*
6. *Data Management, Current Trends, and Challenges*
7. *Distributed Data Base Management—An Early Look*
8. *Systems Integration—Buyer Issues*



Executive Overview





Executive Overview

A

The IS Environment

As Information Systems reaches the end of the 1980s, it is faced with difficult and at times perplexing challenges. The forces driving IS and the issues it must address will, over the next five years, cause a major change in the responsibilities and overall shape of the central information systems function.

Exhibit II-1 lists the five most critical issues facing information systems over the next few years:

- Meeting the ever rising and expanding expectations of senior managers as they demand direct participation of IS for the future success of the organization.
- Responding to users' growing ability to define and demand increasingly complex information-technology-based solutions.
- Managing the technology investment in the face of the expanding wealth of alternatives to deploy information technology.
- Moving to integrate the data/technology/applications environment that during the 1980s has been distributed and populated with heterogeneous technologies.
- Identifying and providing information-technology-based systems to support those aspects of the organization's operation that are considered mission-critical.

EXHIBIT II-1

**INFORMATION SYSTEMS—MAJOR ISSUES
1988**

- Rising Management Expectations
- User Demands for Increasingly Complex Solutions
- Managing the Technology Investment
- Integration of Data/Technology/Applications

To meet these major issues head-on, IS management will have to tighten its priorities, distribute even more of its responsibilities to the end user, and focus its efforts on the areas identified in Exhibit II-2.

As the findings of INPUT's research are explored in this report, the one message that will repeat itself is that IS must narrow its priorities in order to meet management's expectations.

EXHIBIT II-2

INFORMATION SYSTEMS FOCUS

- Develop Clear Delineation of Management Expectations
- Identify Mission-Critical Aspects of the Business
- Build a Process to Work with User Management on Defining Solutions
- Look to the Outside as Well as the Inside for Solutions
- Build a Technology Architecture Understood by Management
- Strengthen and Refocus the Data Management Function to a Company-Wide Orientation

B**Application
Development Trends**

The applications development challenge is unrelenting. INPUT's 1988 research found that the development backlog continues to grow. Over 40% of those interviewed indicated the backlog increased in 1987, and for another 40% it was unchanged. This trend is occurring despite ongoing use of 4GL technology and the end user expansion into the development of production systems. Simply put, the need for information remains an insatiable appetite.

Exhibit II-3 summarizes the key issues facing the applications development manager. The first four deal with the productivity and quality issue that has faced IS since the beginning of time. Each technological advance in the development process is countered by a major step in the demand for systems.

EXHIBIT II-3

APPLICATION DEVELOPMENT—KEY ISSUES

| Issue | Responses (Percent) |
|--------------------------|------------------------|
| Productivity & Quality | 38 |
| Use of Technology | 16 |
| Responsiveness | 14 |
| Development Process | 11 |
| Organization & Direction | 10 |
| Costs | 8 |
| Maintenance | 3 |

On top of the demand for new systems remains the “baggage” of the existing portfolio and its maintenance. On average, about 67% of internal development resources are being allocated to support the existing applications. This figure has been unchanged for a number of years and is simply the result of a management decision on what can be *allocated* to the *old* and the *new*.

However, as the demand for new applications grows, the user and IS manager are more frequently turning to other alternatives including package software and external development resources, or users are doing it themselves. Exhibit II-4 provides an insight into the pervasiveness of

the use of external products and services. Out of a sample of over 200 major projects INPUT found that:

- 35% of the projects are using package software as the core of the solution. This trend is being driven by the user's demand for faster response by IS and the user is often selecting the package. More and more the application software vendors are focusing on the user as the buyer.
- 44% of the projects involve the use of external development resources to a significant degree. While IS remains involved, much of the expertise, effort, and perhaps creativity are being sourced externally.
- Of those projects using external development resources, 52% include the use of package software. This is supported by the growing trend for application software companies to expand their professional services businesses. The buyer (the user) wants a full-service vendor.

EXHIBIT II-4

SOURCES OF DEVELOPMENT RESOURCES— NEW PROJECTS

(Percent)

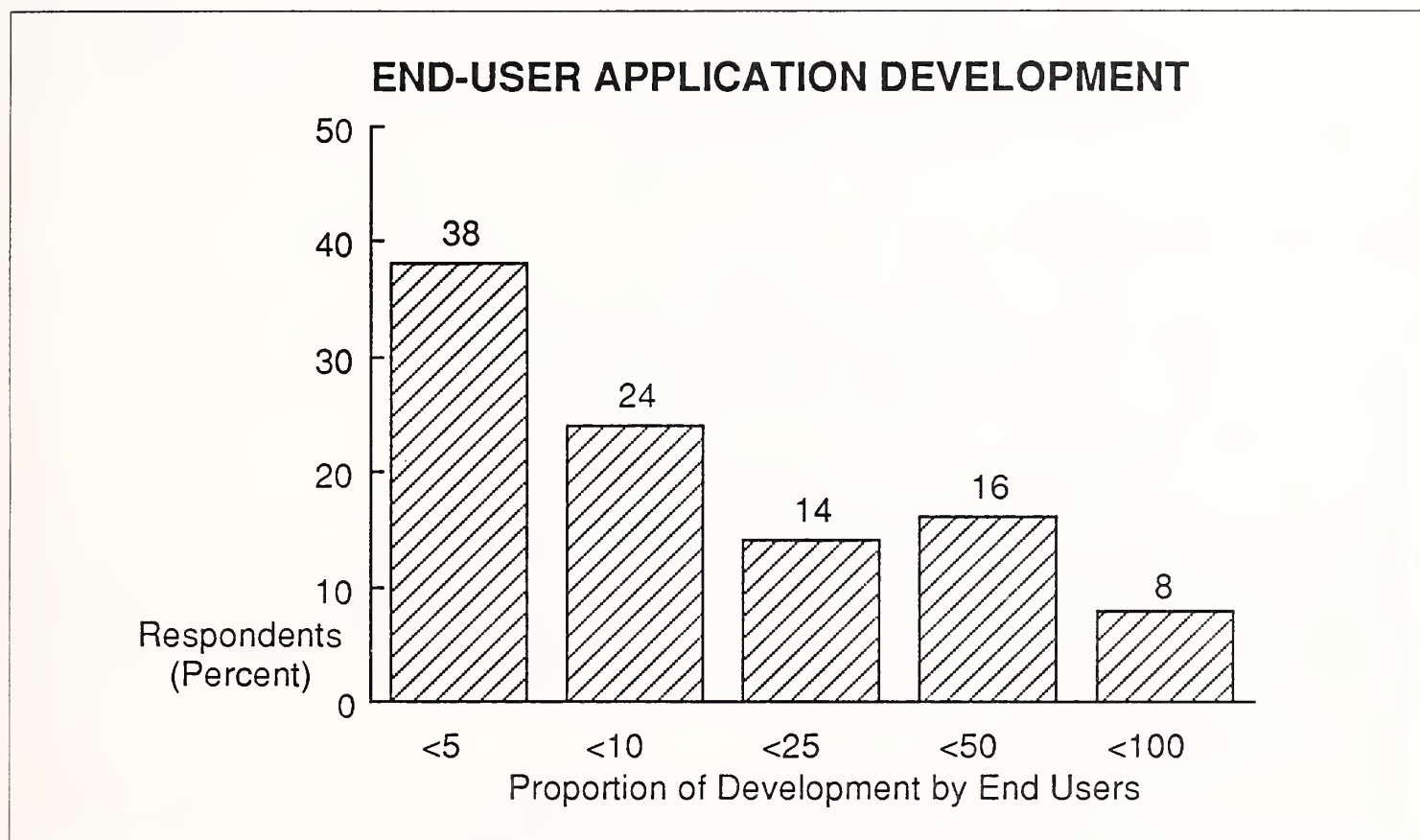
| Source of Staff | Using Packaged Software | Totally Custom Development | TOTAL |
|---------------------|-------------------------|----------------------------|-------|
| Internal | 22 | 78 | 56 |
| Internal & External | 52 | 48 | 44 |
| TOTAL | 35 | 65 | 100 |

INPUT has also found significant evidence that the end user has truly begun to develop production systems, as opposed to personal productivity systems.

- Over 50% of the organizations interviewed indicated that end users were developing production systems.

- Exhibit II-5 provides further indication of these trends. For those organizations where the user is developing production systems, 24% indicated the user would produce more than 25% of the new systems in 1988. Soon this will be true for all organizations.

EXHIBIT II-5



For the foreseeable future, the applications backlog will not disappear and probably will not even decline. However, an ever-increasing proportion of the need will be met by the end users doing it themselves or by turning to external products and services.

C

Information Systems Budget

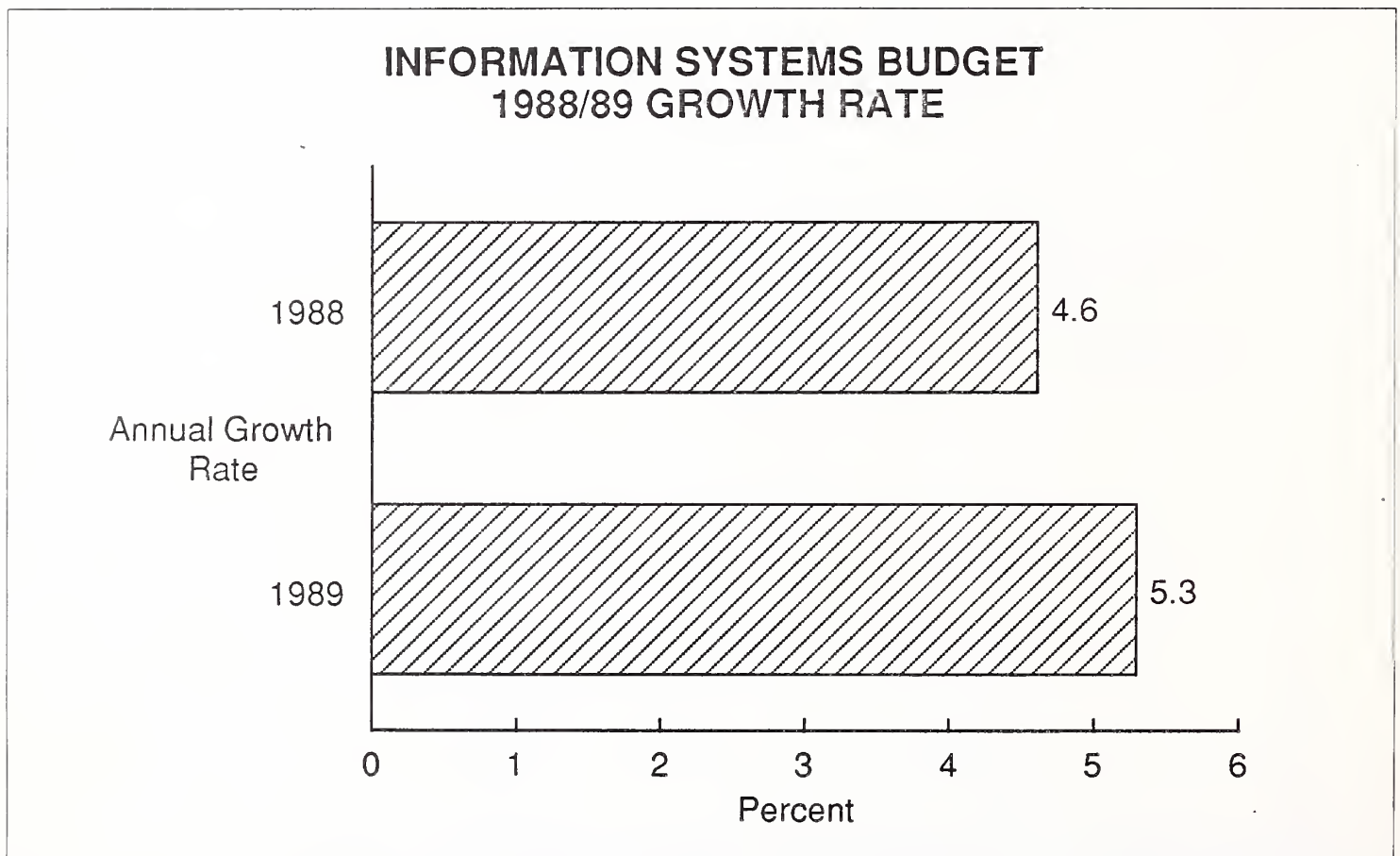
INPUT finds the information systems budget continuing its modest growth of prior years. Also, the central IS budget is becoming less of an indicator of the true trend in spending for information technology.

- INPUT found that 43% of IS budgets do not include operating division IS expenditures and, more important, 39% do not include end user expenditures.
- INPUT also found that these two segments, when included, routinely represent over 40% of the total IS budget. Furthermore, they tend to represent areas where most of the new expenditures are taking place.

As a result, a growing segment of the total IS expenditure level is not being reflected in the budget routinely tracked by industry. Management is going to have to look more closely if it is to track the total investment in information technology.

Exhibit II-6 indicates the modest increases for 1987 and 1988 based on the 200 organizations surveyed. The increases can be compared with the growth rates being experienced by the industry vendor community. The vendor growth rate for information services firms, as tracked by INPUT, is about three times the rate found for IS budgets. The source of those funds must be user budgets.

EXHIBIT II-6

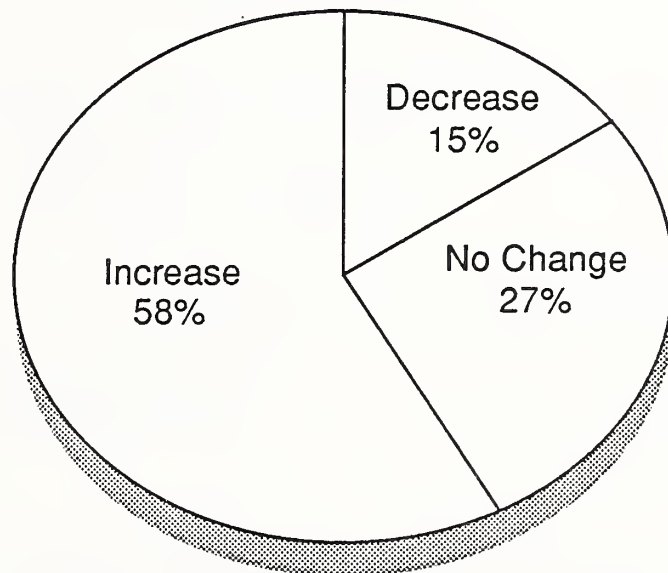


As shown in Exhibit II-7, there is some improvement in the IS budget outlook for 1989, with 67% projecting some increase versus 58% in 1988. The change is from a decrease in the budgets to an increase, with the proportion indicating essentially no change.

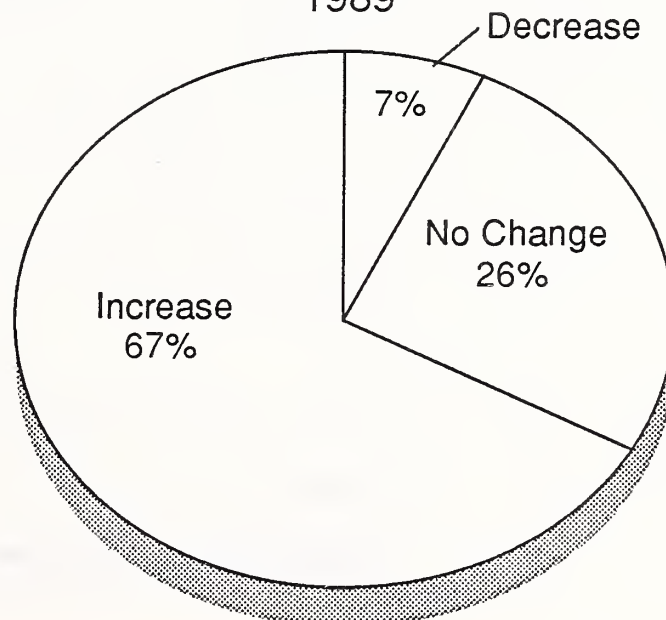
EXHIBIT II-7

**INFORMATION SYSTEMS BUDGET
DISTRIBUTION OF GROWTH RATES**

1988



1989



The final budget exhibit (Exhibit II-8) provides a distribution of the budget in the traditional major categories.

- The greatest increases are in the communications segment.
- Within the computer hardware segment, the primary growth is in personal computers.
- The no-growth projection for external products and services for 1989 is misleading. INPUT projects this segment to continue to grow over the next five years with an ever-increasing proportion of these expenditures, especially for application software and professional services, being funded directly from the users' operating budgets.

EXHIBIT II-8

INFORMATION SYSTEMS BUDGET DISTRIBUTION AND GROWTH

(Percent)

| Category | Distribution | | Growth | |
|------------------------------|--------------|------------|------------|------------|
| | 1987 | 1988 | 1988 | 1989 |
| Personnel | 40 | 39 | 2 | 2 |
| Computer Hardware | 28 | 28 | 5 | 4 |
| Communications | 11 | 12 | 14 | 6 |
| External Products & Services | 16 | 16 | 5 | 2 |
| Other | 5 | 5 | 5 | 0 |
| TOTAL | 100 | 100 | 4.6 | 5.3 |

Being sensitive to the costs of the IS function is no longer adequate. Today IS must put forth progressive ideas and take the risks required to make its organization more competitive.

D**Impact of New Technology**

The expanding wealth of technology continues to both plague and benefit information systems. The challenge is to pick from an ever-expanding set of alternatives while maintaining an integrated network. Exhibit II-9 provides a summary of the new technologies being investigated and tried. The breadth of the list is a true indication of the existing opportunities.

Understanding the different technologies is an immense challenge and is another reason why IS managers are turning to external resources. Technology architecture planning and selection must be a priority of the central IS organization.

EXHIBIT II-9

PLANNED COMPUTING TECHNOLOGIES

| Category | Proportion of Responses (Percent) |
|---|-----------------------------------|
| Voice, Image and Optical Data Entry and Storage | 21 |
| LANs and Integrated Distributed Processing | 13 |
| Networking and Connectivity | 12 |
| Intelligent Workstations | 11 |
| CASE and Related Application Development | 10 |
| Application Solutions | 9 |
| AI and Expert Systems | 8 |
| Data Base Management Systems | 8 |
| Electronic Data Interchange | 4 |
| Office Systems | 3 |

E**Conclusions and
Recommendations**

There is much to do to prepare for the 1990s. Exhibit II-10 lists INPUT's top priority recommendations to IS management over the next few years. Doing these tasks to the best of their ability is paramount for the success of the central IS function. And to do this, central IS must continue to shift tactical and implementation responsibilities to the end user and decentralized IS teams. Central IS cannot and should not do it all. The department must focus on where it can contribute the most and on those specific tasks it can perform best.

EXHIBIT II-10

**INFORMATION SYSTEMS PRIORITIES
BEYOND 1989**

- Set and Communicate Clear Expectations for the IS Program
- Identify the True Mission-Critical Processes
- Build an Application Development Environment That Supports Use of All Resource Sources
- Refocus Data Management to a Company-Wide Orientation
- Monitor IS Programs of the Competition
- Build a Technology Plan Acceptable to Management
- Reorient Central IS to a Consulting Role

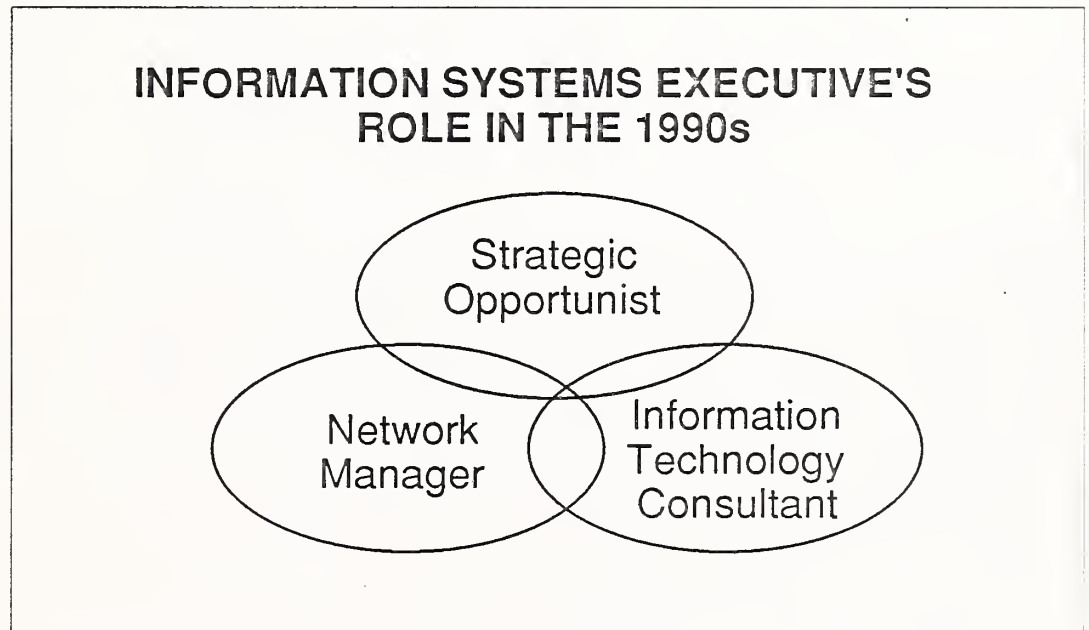
Information Systems management must:

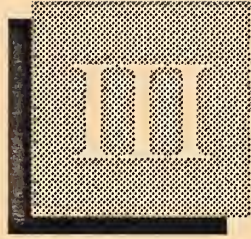
- Work with management to assure clearly defined expectations are set and communicated to the entire IS organization.
- Implement a process to identify and assess mission-critical operations.
- Build an application acquisition environment that draws on all resource options.

- Concentrate its energies on the infrastructure tasks including company-wide data management and technology architecture.
- Evolve to a consulting style of support with ever-expanding control of day-to-day information systems activity at the operational level.

Exhibit II-11 depicts INPUT's projection of the IS role that will prove most successful in the 1990s. The senior IS executive will have to be the Strategic Opportunist searching for new uses of information technology, the Network Manager operating the network (but not the distributed processing points), and the Infrastructure Manager providing the architecture and environment to support an expansive and decentralized implementation of information technology.

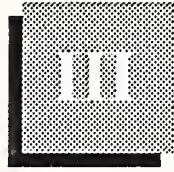
EXHIBIT II-11





Driving Forces





Driving Forces

A

Climate

As Information Systems prepares to enter the last year of the decade, it finds its toughest challenge to date. After years of deploying data base, distributed processing, and personal computing technology, the information network of most large organizations is dispersed, not integrated, and populated with multiple technologies.

At the same time, the focus on information systems by senior management has taken on a new intensity. Too many examples exist where an organization has used information technology to gain a competitive advantage or to greatly streamline its operations and related services to whomever it serves. The result is simple: senior management of many, if not most, organizations expect their information systems function can do the same. And if not, they are prepared to turn to an outside organization for strategic systems help.

The current situation facing IS management follows at least five years of constrained budgets, limited growth plans, and the continuing application development backlog. And during those five years, the impact on the end user has taken on new and major proportions. As a result information systems management must take on a new focus.

IS management must identify and understand those external forces that are driving the deployment of information technology over the next five years.

B

1988 Versus 1987

The focus on information systems has been going through a major evolution since about 1985 when the concepts of the chief information officer and mission-critical systems received first mention. Since that time the typical information systems executive has found the world in which he

works much different than it was in the first half of the 1980s. The exposure within the organization, the basis upon which IS is measured, and the forces impacting strategies, plans, and reputation have all changed.

These changes have been driven primarily by those few organizations (corporations) whose senior management has seen the value of using information technology for business advantage. Once information technology becomes more than just a means to improve the efficiency and effectiveness of a business process—that is, when it becomes an element of a business's strategy—the rules change.

Each year INPUT identifies the “driving forces”—those external business and environmental forces most directly impacting the information systems organization. In the *1987 Information Systems Planning Report*, INPUT identified the diving forces as those listed in Exhibit III-1. For 1988, as shown in Exhibit III-2, INPUT has revised the information systems' driving forces. This chapter discusses each of the 1988 driving forces and the changes that are taking place.

EXHIBIT III-1**INFORMATION SYSTEMS DRIVING FORCES—
1987**

- Rising Expectations of Senior Management
- Cost-Sensitive Business Environment
- Ability to Conceptualize More-Complex Applications
- Expanding Wealth of Powerful Technology
- Growing Interaction between Large Organizations
- Unstable Organizational Environment

EXHIBIT III-2

**INFORMATION SYSTEMS DRIVING FORCES—
1988**

- Bottom Line Return
- Rapid Response and Deployment
- Expanding Wealth of Technology
- International Competition
- Unstable Organizational Environment

1. Bottom Line Return

In 1987 the driving forces were “rising expectations of senior management” and “cost-sensitive business environment.” For 1988 these two forces have merged into “bottom line management.”

As the 1990s approach, senior managers have begun to focus their expectations of IS. They have become refined to a degree where it is now more appropriate to measure the impact information systems is expected to have: a *bottom line return on the investment*. Today’s CIO is expected to contribute directly to the fulfillment of the organization’s mission, not just as a support function. In too many industries the competitive edge is in the services, not the products; and services are controlled and often executed through information technology.

Being sensitive to the costs of the IS function is no longer adequate, but it is only part of the job. Today IS must put forth progressive ideas and offer to take risks to make the organization it serves competitive.

2. Rapid Response and Deployment

Today’s applications are increasingly more-expansive and complex. It has become a requirement that IS have the “ability to conceptualize more-complex applications.” The true driving force is now the speed required to respond to the requirement, be it complex or not.

The pressure for “rapid response and deployment” is changing the way many IS organizations are managed. The entire systems integration

phenomenon, where an outside organization is hired to design, develop, deploy, and support a major system, is a direct result of senior management asking for information-technology-based business solutions to complex problems that can be deployed in record time.

The IS organization often finds this demand beyond its ability to respond and is supporting the use of outside organizations that will bring new ideas and share the risks.

3. Expanding Wealth of Technology

This driving force remains unchanged from 1987. The rate with which new information technology is becoming available is not lessening. The range of alternative solutions for many systems requirements is at times overwhelming.

The need has never been greater for an overall information architecture, especially one that is understood by operating as well as IS management.

4. International Competition

The organizational focus has shifted over the past year from the "growing interaction between large organizations" to "international competition." Today organizations are often joining together to support standards, such as those required for Electronic Data Interchange (EDI) systems that are intended to help an industry better serve its clients. These interorganizational activities provide benefits, but at the same time remove competitive advantages from those who lead the way. As a result, management is looking to IS for new ideas.

EDI and information technology in general, meanwhile, are removing international barriers to competition. For many industries competition is not just within one country, but worldwide. The progressive information systems executive is monitoring the information systems programs of direct and indirect competitors on an international scale.

5. Unstable Organizational Environment

Today's general business climate retains a significant element of instability. Mergers, acquisitions, spin-offs, and more are happening to unsuspecting organizations. These activities directly impact the information programs of both parties.

Many a merger has been helped by the IS executive preplanning the integration of the information systems programs. Although such integration is often painful and challenging, it is a direct *bottom line* contribution if performed successfully—and, if performed poorly, the opposite is true.

Every IS executive needs to have a plan ready in the event of a major organizational change. For companies actively acquiring other companies, the IS challenge can be immense. The need may be for a very flexible and straightforward IS strategy, one that has a "go slow" attitude on using the latest technology.

C**Impact on
Information Systems**

The changing climate and the driving forces suggest the following strategies for information systems, as listed in Exhibit III-3.

EXHIBIT III-3**1988 DRIVING FORCES—
IMPACT ON INFORMATION SYSTEMS**

- Think Like an Operating Unit
- Be Flexible in the Use of Outside Resources and Solutions
- Maintain a Well-Understood Technology Architecture
- Keep an Eye on Competition
- Be Sure the IS Strategy Supports the Business Strategy

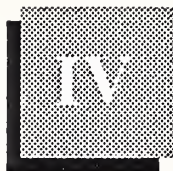
- No longer can IS consider itself a support function. It must think and act as a part of the business mission itself.
- Shake off the "not invented here" syndrome and identify the mission-critical systems opportunities.
- The technology challenge is immense. The winning IS manager will have a reasonably flexible technology strategy that is understood by business management. Together they can share the risks of changing that strategy.
- If management expects to beat the competition through the use of information technology, then IS must monitor the information systems programs of the competition.

- At no time has it been more important for IS to understand the mission of the organization served and to have an IS strategy that is tightly tied to that mission. IS is becoming the element that can assure success, whether it be a new way to operate a portion of the business or in completing a merger successfully.



Major Issues





Major Issues

A

Introduction

Perhaps the largest challenge facing information systems management in the late 1980s is the challenge to set and maintain priorities. From the changing role of IS to the proliferation of technology to business operating pressures, searching for the balance of priorities is “just plain tough.”

At the same time setting those priorities is without doubt the most important task of the IS executive. In the *1987 Information Systems Planning Report*, INPUT identified six major issues IS management must address over the next few years if IS is to serve to the best of its ability within its changing role. Those issues are listed in Exhibit IV-1.

The 1987 report assessed each of the major issues in-depth, providing:

- Elements of the issue—a definition and current status.
- Trends—the current and projected response by IS.
- Objectives—the goals INPUT urged IS to set for itself.

The past year has brought these issues into sharper focus and, just as the driving forces have changed, so have the major issues. In this chapter, INPUT assesses the issues uncovered in its 1988 research and documents the changes of importance to IS management from the 1987 report.

EXHIBIT IV-1

**INFORMATION SYSTEMS—MAJOR ISSUES
1987**

- Business Contribution
- Connectivity
- Development Productivity
- Data Management
- Integration
- User Involvement

B**1988 Versus 1987**

For 1988, INPUT has revised its list of major information systems issues to those in Exhibit IV-2. There are some significant shifts from the 1987 list. This section will discuss each of the issues and highlight the change from 1987.

EXHIBIT IV-2

**INFORMATION SYSTEMS—MAJOR ISSUES
1988**

- Rising Management Expectations
- User Demands for Increasingly Complex Solutions
- Managing the Technology Investment
- Integration of Data/Technology/Applications
- Delivery of Mission-Critical Systems

A key factor in the revisions for 1988 was this year's budget and issues survey. In that interview, each respondent was asked to identify the critical issues facing its IS organization. Exhibit IV-3 summarizes the approximately 600 responses to this question.

- The magnitude of the technology issue response caused the broadening of last year's connectivity and development productivity issue to "managing the technology investment."
- The responses of managing IS (24%) and IS direction (8%) combine to reinforce the concern about the changing role of the central IS function and the "rising expectations of management."
- The mention of industry-specific issues 9% of the time suggests the "mission-critical systems" issue.

EXHIBIT IV-3

INFORMATION SYSTEMS—MAJOR ISSUES 1988 SURVEY RESULTS

| Issue | Responses (Percent) |
|-------------------|------------------------|
| Technology | 31 |
| Managing IS | 24 |
| Application Needs | 22 |
| Industry Specific | 9 |
| IS Direction | 8 |
| Organization | 5 |
| General Economy | 1 |

1. Rising Management Expectations and Delivery of Mission-Critical Systems

In 1987, “rising expectations of senior management” was a driving force and the major issue was “business contribution.” For 1988 and beyond, the attention of management becomes more focused and intense. Management is truly beginning to measure IS on a bottom line contribution basis and is setting well-defined expectations that include solving strategic problems—i.e., delivering mission-critical systems.

These two major issues, “rising management expectations” and “delivery of mission-critical systems,” represent the ultimate challenge to IS becoming a true equal in its organization. These issues have been purposely placed at the top and bottom of INPUT’s list to encircle the more traditional and easily understood issues. Management sees other organizations deploying information technology for competitive advantage and believes it must do the same. The challenge is for IS to become truly creative in the solutions it provides and the speed with which it provides them.

The challenge for IS managers is to gain clarity from its management on what their expectations are and the resources available to meet those expectations. Is it acceptable to go outside for a solution, will operating management support the change required in the business to take advantage of new technology, and just where are the critical missions that need systems support? It is unlikely that every mission-critical or strategic system is as complex as an airline reservation system or a fully integrated customer data base for a major bank. It may only require placing EDI on the priority list and assuring that all of the affected users support the change in business operating philosophy.

2. User Demands for Increasingly Complex Solutions

INPUT believes the end user involvement issue is in the process of major change. The knowledge and experience base of clerical, professional, managerial, and executive users is reaching the critical mass where they are capable of contributing at every step of the information systems process, and in many cases performing the steps with their own skills and resources.

In Chapter V, INPUT reports on the rate with which end users are developing *production*, as opposed to *personal productivity* systems. This finding, combined with the use of personal computers as the “window to the information network” and the continued growth of departmental computing, confirms that the user is assuming more control.

One very critical result of this expanded knowledge base is the desire by user management to define the “preferred” solution to a systems require-

ment. This in turn results in the user, which better understands its business, defining increasingly complex solutions. The user's requirement is not an *application*, but a *solution* based on information technology that provides a solution to a business need.

The challenge for IS management is increased pressure to understand the business as user management understands it and to be able to think in terms of solutions rather than traditional applications.

3. Managing the Technology Investment

INPUT's 1987 major issues list included two specific technology issues—"connectivity" (networking) and "development productivity." INPUT now finds that list too narrow. The true issue for the next few years is "managing the technology investment."

Exhibit IV-3 identified "technology" as the most frequently mentioned response to the critical issues question. Exhibit IV-4 provides a breakdown of those responses. Not surprising, "networking" is at the top of the list as IS works to tie together the dispersed networks that have been deployed over the past few years.

The entire list suggests the breadth of the task needed to take advantage of the expanding wealth of technology. The "other" category is a collection of technology issues ranging from migration to new untested technologies such as voice and optical-based capabilities.

Today general management is testing the prior investment in IS technology and tying new investments to the business's goals. The IS manager must look at the technology architecture and plan one that balances the wealth of alternatives with the ability to manage and control that which is deployed.

EXHIBIT IV-4

TECHNOLOGY ISSUES 1988 SURVEY RESULTS

| Issue | Responses (Percent) |
|---------------------|------------------------|
| Networking | 29 |
| Hardware | 26 |
| Data Base | 10 |
| Managing Technology | 6 |
| Other | 29 |

4. Integration of Data/Technology/Applications

The 1987 issues of "data management" and "integration" have been combined to "integration of data/technology/applications" in the 1988 survey. The challenge is on to provide the infrastructure so users can access information when they need it. Following years of distributed processing, users building their own analysis systems with independent data entry, and a central-only focus for the data management function, a critical need exists to tie the network back together.

Driving this issue is a growing requirement for integrity. User demand for a single access (window) to the organization's information network also drives this trend. The result will be increased use of relational DBMS technology at the departmental and personal computing tiers of the network, a change in the breadth of responsibility of the central data management function, concentration on deploying connectivity products, and eventually a change in the way applications are designed so they take advantage of the relative capabilities of each tier of the network.

Redefining the role of data management, providing the tools required, and establishing its position relative to the total information network are all tasks of great importance and necessity if the challenge of integration is to be met.

C

Blocking Factors

In addition to the major issues and driving forces discussed here and in Chapter III, information systems efforts are being impacted by a group of inhibiting factors. These factors, as listed in Exhibit IV-5, are at the core of the information systems environment today and are a direct result of the business and technology challenges of the 1980s.

- *Infrastructure Gridlock*: Points to the challenge to integrate new and existing technology and to manage an information network that includes multiple vendors. Without the required standards and network control tools, IS has been hampered in its effort to implement a reasonably integrated yet flexible infrastructure. The technology to do so is on the horizon and will be a major priority for IS over the next few years.
- *Lack of Qualified Personnel*: For the past few years there has been only nominal growth in IS staff, yet the demands and complexity have grown immensely. In addition, the long-standing challenge for IS professionals to “understand the business” has now become essential. The result will cause a refocusing of IS training programs and more important, an increase in the use of external resources for systems development.
- *Existing Applications Portfolio*: The investment of prior years will be with IS for the next decade at least. Chapter V will reconfirm that supporting existing applications is consuming two-thirds of available development resources. This area will remain a noose around the neck of the central IS group and warrants new creativity to balance the burden.
- *Organizational Response Time*: IS has routinely been criticized for a lack of adequate response and timeliness. As the 1990s approach, the challenge continues to grow. This will continue to lead to the use of external products and services for the development and deployment of solutions.

Maneuvering within these blocking factors adds to the IS management challenge as they address the major issues discussed in this chapter.

EXHIBIT IV-5

**INFORMATION SYSTEMS—
BLOCKING FACTORS**

- Infrastructure Gridlock
- Lack of Qualified Personnel
- Existing Applications Portfolio
- Organizational Response Time

D**Information Systems
Focus**

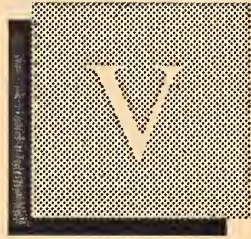
Countering the major issues just described suggests IS management needs to focus its priorities. The list in Exhibit IV-6, while not all inclusive, does provide a starting point.

EXHIBIT IV-6

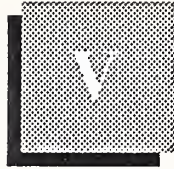
**1988 MAJOR ISSUES—
INFORMATION SYSTEMS FOCUS**

- Develop Clear Delineation of Management Expectations
- Identify Mission-Critical Aspects of the Business
- Build a Process to Work with User Management on Defining Solutions
- Look to the Outside as Well as the Inside for Solutions
- Build a Technology Architecture Understood by Management
- Strengthen and Refocus the Data Management Function to a Company-Wide Orientation

- Meet senior management's expectations of IS head-on. Working to clarify them and to assure they are broadly comprehended will help provide the IS staff with a true understanding of its target.
- Identify and prioritize the mission-critical aspects of an operation. This will remove the mystery from this overly simple recipe for how to beat the competition.
- Today's solutions to business problems are often different from an application system. Setting up a process to jointly—with user management—define solutions will go a long way to clarify the objectives and to assure a common target.
- Shake off the "not invented here syndrome." There are too many ways to attack a problem for one IS staff to know them all. Using outside resources will infuse new ideas, speed deployment, and share the risks.
- Leverage technology in a planned fashion—the true objective of information systems. Finding the balance between flexibility and ease of control is essential to supporting a progressive IS program. Users must begin to understand the overall technology architecture so they are willing to work with it, not inadvertently against it.
- One assured long-term responsibility of central information systems will be the overall data management function. Today, however, data administration too often has a myopic corporate data base view. It is fundamental to the integration issue that data management take on a broader architectural role and that the tools and processes of the function be enhanced to support this role.



Application Development Trends



Application Development Trends

A

Introduction

The applications development function of information systems faces a number of traditional and new issues and trends.

- The existing applications portfolio is bigger, includes numerous technologies, and is more expensive to maintain.
- The fundamental infrastructure of the application network is beginning to undergo a major change to relational data base technology and to a distributed but integrated technical environment.
- The PC is becoming a full network workstation, introducing yet another alternative for the development of applications.
- The role of the end user in the application development process is spreading to all aspects, including detail design and coding.
- There is a shortage of qualified staff to support the demand for applications development.

INPUT's research suggests that the challenges, alternatives, and resources available are much different from just a couple of years ago. In this chapter, INPUT frames the application development challenge, identifies the key trends, and sets objectives for the next few years.

B

Key Issues

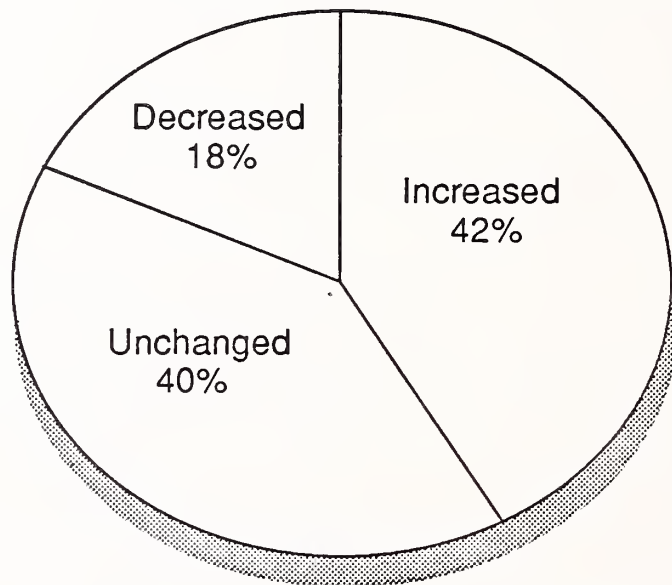
On the one hand the application development environment never changes: The development backlog and the maintenance workload continue to grow, and the demand for bigger, better applications continues to mount.

As Exhibit V-1 shows, the development backlog remains the underlying challenge facing the application development function. In two separate surveys INPUT found that over 40% of the organizations indicated the

EXHIBIT V-1

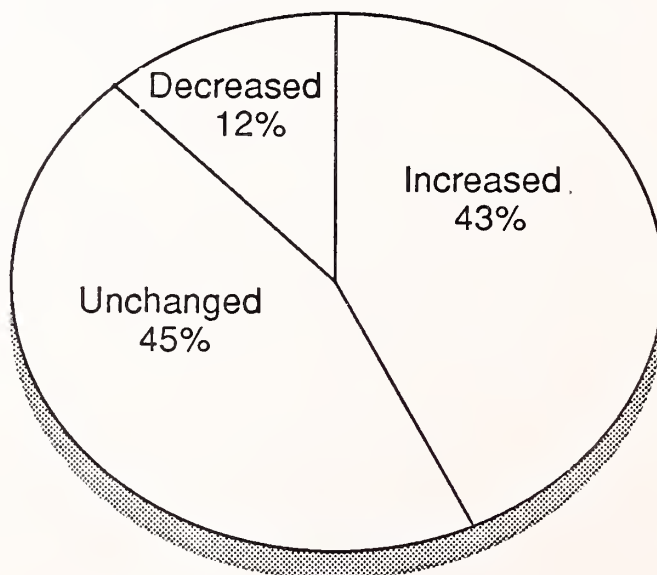
APPLICATION DEVELOPMENT—BACKLOG 1987 VERSUS 1988

Budget & Issue Survey



Sample Size 211

Applications Development Survey



Sample Size 103

backlog was greater at the end of 1987 than at the beginning; another 40% or more indicated the backlog was unchanged. Since many IS organizations limit the backlog to three years, it can be concluded that four out of every five applications development functions are, at best, no worse off than they were one year ago.

Clearly all of the purported benefits of 4GLs and other advances have not affected the ability to meet the applications demand.

The *productivity* issue remains at the heart of the application development challenge. Exhibit V-2 shows the combined responses to INPUT's question, "Please indicate the top three issues facing applications development."

- There is little doubt that productivity is the primary issue; it received 38% of the responses. Also of note is the routine linking of productivity with quality. While responsiveness is a goal of the development staff, the true measure of productivity includes quality. Quality of the new application is one answer to controlling maintenance in the future.
- The next three issues—use of technology, responsiveness, and development process—also all tie directly to the issue of the productivity and effectiveness of the applications development function.
- Together, the top four issues account for four out of every five responses.

Just to confirm the importance of productivity, INPUT asked development managers if it was more, the same, or less critical than last year. A full 57% indicated productivity was now *more* critical and 40% indicated it was the same. The productivity issue is not improving and it seems to overshadow most other issues.

EXHIBIT V-2

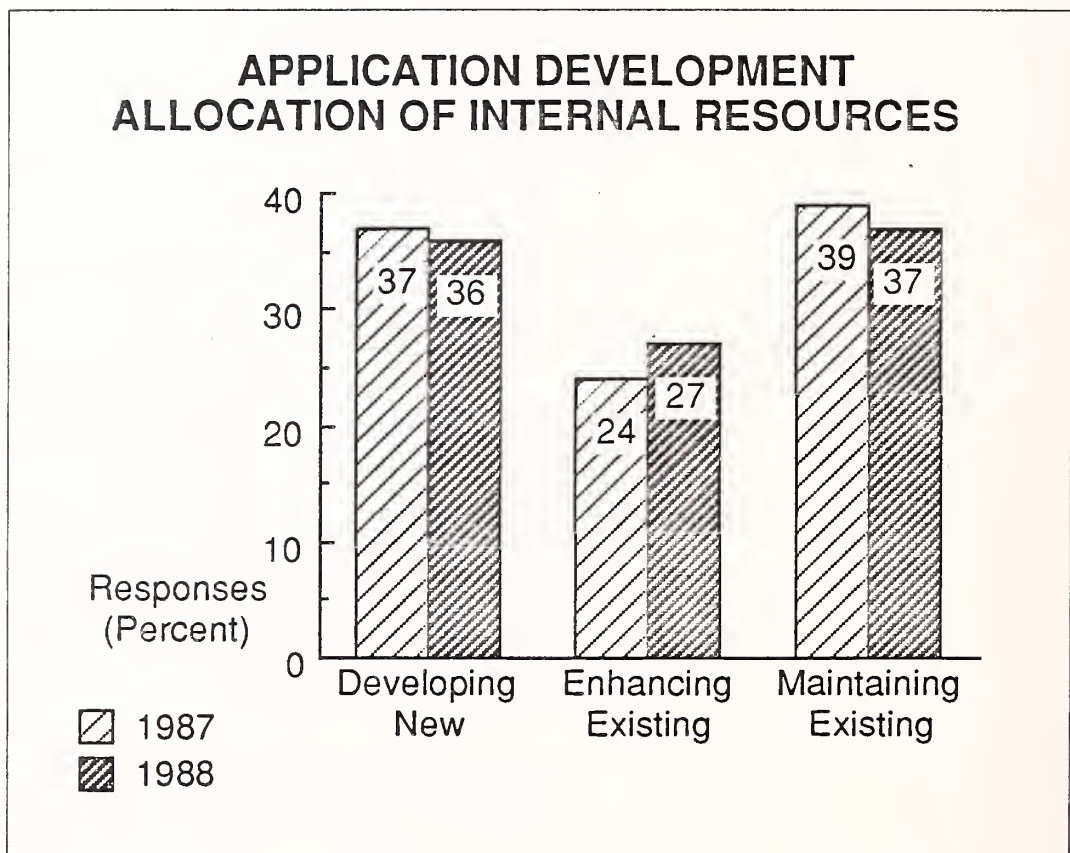
APPLICATION DEVELOPMENT—KEY ISSUES

| Issue | Responses (Percent) |
|--------------------------|------------------------|
| Productivity & Quality | 38 |
| Use of Technology | 16 |
| Responsiveness | 14 |
| Development Process | 11 |
| Organization & Direction | 10 |
| Costs | 8 |
| Maintenance | 3 |

Second to productivity is the general issue of resource availability. For too many years IS has been trapped by the need to maintain and enhance existing systems. Exhibit V-3 confirms that demands for supporting existing systems continues to consume almost two-thirds (37% for *Maintaining* and 27% for *Enhancing* existing systems) of the application development resources.

- The comparison of 1988 to 1987 indicates no improvement and a possible worsening of the situation.
- These findings were confirmed in both the applications development and budget and issue interviews.

EXHIBIT V-3



It is safe to say that the allocation process has become more difficult and arbitrary. About one-third of the available resources go to new development and the remainder (about two-thirds) struggle to protect the existing portfolio.

- The “maintenance” allocation has been unchanged for a number of years. In general the existing application portfolio gets two-thirds of the resources. Given limited growth in development staff and the growing size of the portfolio, the support of existing applications may be declining.

- Setting priorities against this limited resource has resulted in the ever-increasing trends to purchasing package software and the expanded involvement of the end user in the development process.

The next two segments of this chapter will look at the trends that are a direct result of the resource dilemma.

C

Key Trends

INPUT's findings identify three underlying trends impacting the applications development function:

1. **Development Sourcing:** There is a growing move toward the use of packaged software and external sources of application development resources.
2. **End User Development:** End users are participating more directly in the application development process at the detail design and programming phases and assuming more control of the overall process.
3. **Use of New Technology:** INPUT's findings indicate that the age of the Relational DBMS has arrived and that CASE is beginning to be considered.

1. Development Sourcing

The Information Systems application development organization is "strapped." After more than five years of constraint on budgets and the decentralization of at least some of its staff to operating and departmental units, the development function is under extreme pressure to provide bigger and better applications and to do so on a more responsive basis. Perhaps the challenge hasn't changed, but the pressure surely seems much greater.

As a result, the applications development manager, the IS executive, and the end user's manager are increasingly looking to the outside for help. Both packaged software and the use of external development resources are becoming more common. The applications software and professional services markets are two of the fastest growing segments of the information services markets, as revealed in INPUT's 1987 and 1988 market forecasts.

EXHIBIT V-4

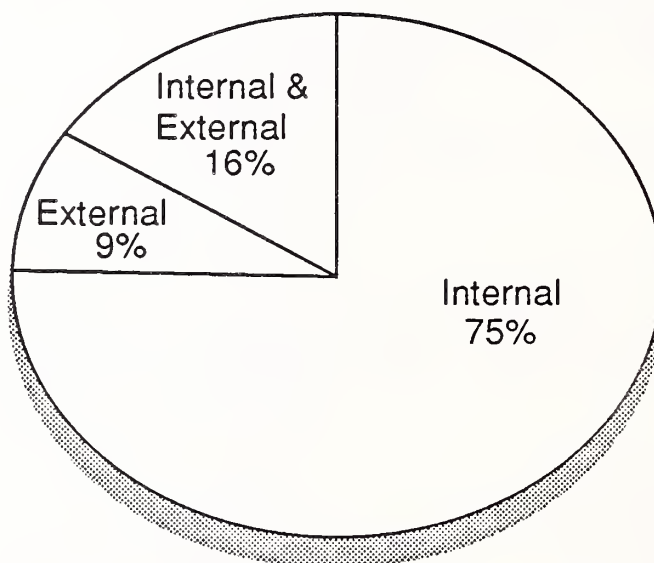
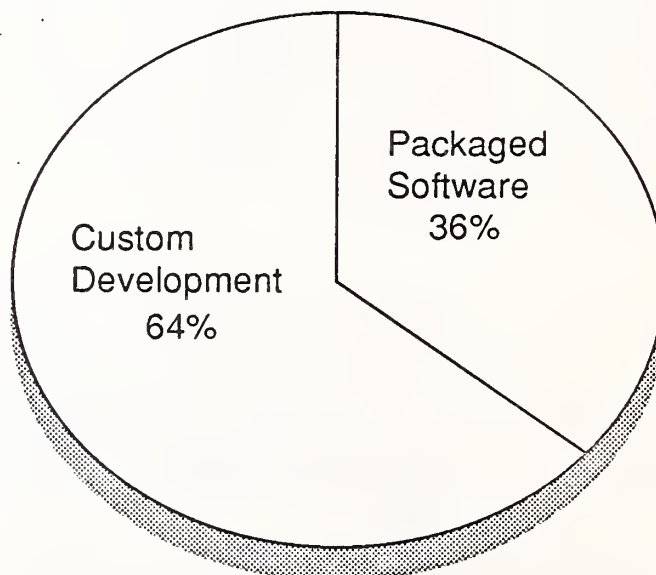
**SOURCES OF DEVELOPMENT RESOURCES
1988****Internal versus External Sourcing****Package Software versus Custom Development**

Exhibit V-4 provides a sense of the magnitude of external sourcing. The first chart indicates that of the total development resources to be consumed in 1988, 25% (9% + 16%) include the use of external staff. The second chart indicates 36% of the resources will be used in conjunction with packaged software. Furthermore, INPUT found:

- Two out of every three application development organizations indicated they plan to make some use of external staff during 1988.
- Three out of every four plan to make use of packaged software during 1988.

This trend is even more definitive when one looks at the sourcing plans for major projects (versus all development).

INPUT's Application Development assessment identified more than 200 major projects and asked how they were to be supported. The results are shown in Exhibit V-5.

EXHIBIT V-5

SOURCES OF DEVELOPMENT RESOURCES— NEW PROJECTS

(Percent)

| Source of Staff | Using Packaged Software | Totally Custom Development | TOTAL |
|---------------------|-------------------------|----------------------------|-------|
| Internal | 22 | 78 | 56 |
| Internal & External | 52 | 48 | 44 |
| TOTAL | 35 | 65 | 100 |

- 44% of major projects will make use of some external development resources.
- 35% will make use of packaged software.

- 52% of the projects that will use external staff will also use packaged software. This finding supports the trend by software vendors such as Oracle Corporation to develop a strong professional services business.

There is little doubt that the applications development process is being supported to a greater degree by non-internal custom development. Perhaps out of necessity the “not invented here” syndrome has finally begun to go into remission.

2. Systems Integration

The development sourcing challenge is leading to a new approach to major systems. Called systems integration, it is the growing tendency for an organization to move to the use of external organizations to provide major complex systems and integration of existing or new systems.

The “systems integrator,” either a professional services firm (e.g., Arthur Andersen), hardware manufacturer (e.g., IBM) or systems services supplier (e.g., Martin Marietta Data Services) provides the total system including hardware, software, and installation and manages the project from conception to completion. The role of the internal systems organization is supportive versus one of leadership.

INPUT’s research into systems integration indicates organizations are turning to this solution to augment the resources available and to gain access to capabilities beyond those of the internal IS function. As the solutions become more complex, the technology more diverse and the time frame for deployment shorter, using a systems integrator will become a more common alternative.

3. End-User Development

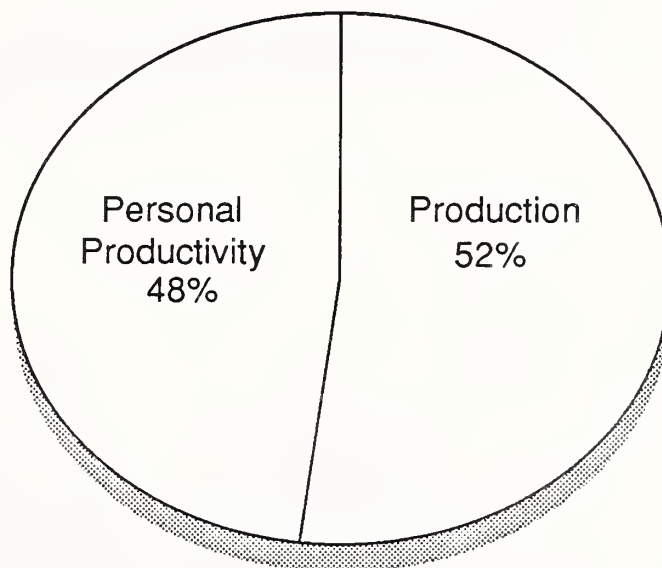
The trend toward application development by the end user has been underway for a number of years. In 1988, however, it has taken on new character. The personal computer is becoming the standard network workstation, departmental computing is in place and the user has begun to move from the development of personal productivity systems to production systems.

INPUT asked in both the Budget and Issue and Application Development questionnaires whether the end user was developing production systems. The definition of a production system developed by an end user was the following: “An application that is intended for multiple users and that has an intended useful life beyond the expected tenure of the user/developer in the using department.” Both assessments found that over half of the organizations felt this was happening.

EXHIBIT V-6

**END-USER APPLICATION DEVELOPMENT
ACTIVITY LEVEL**

Budget & Issue Survey



Applications Development Survey

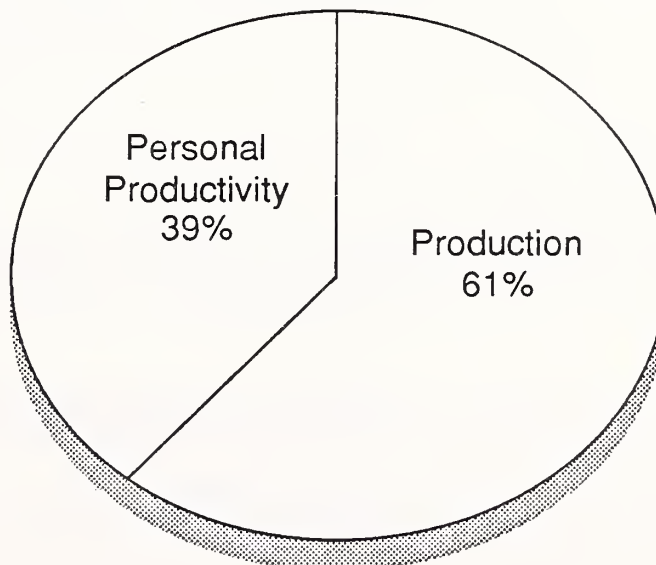
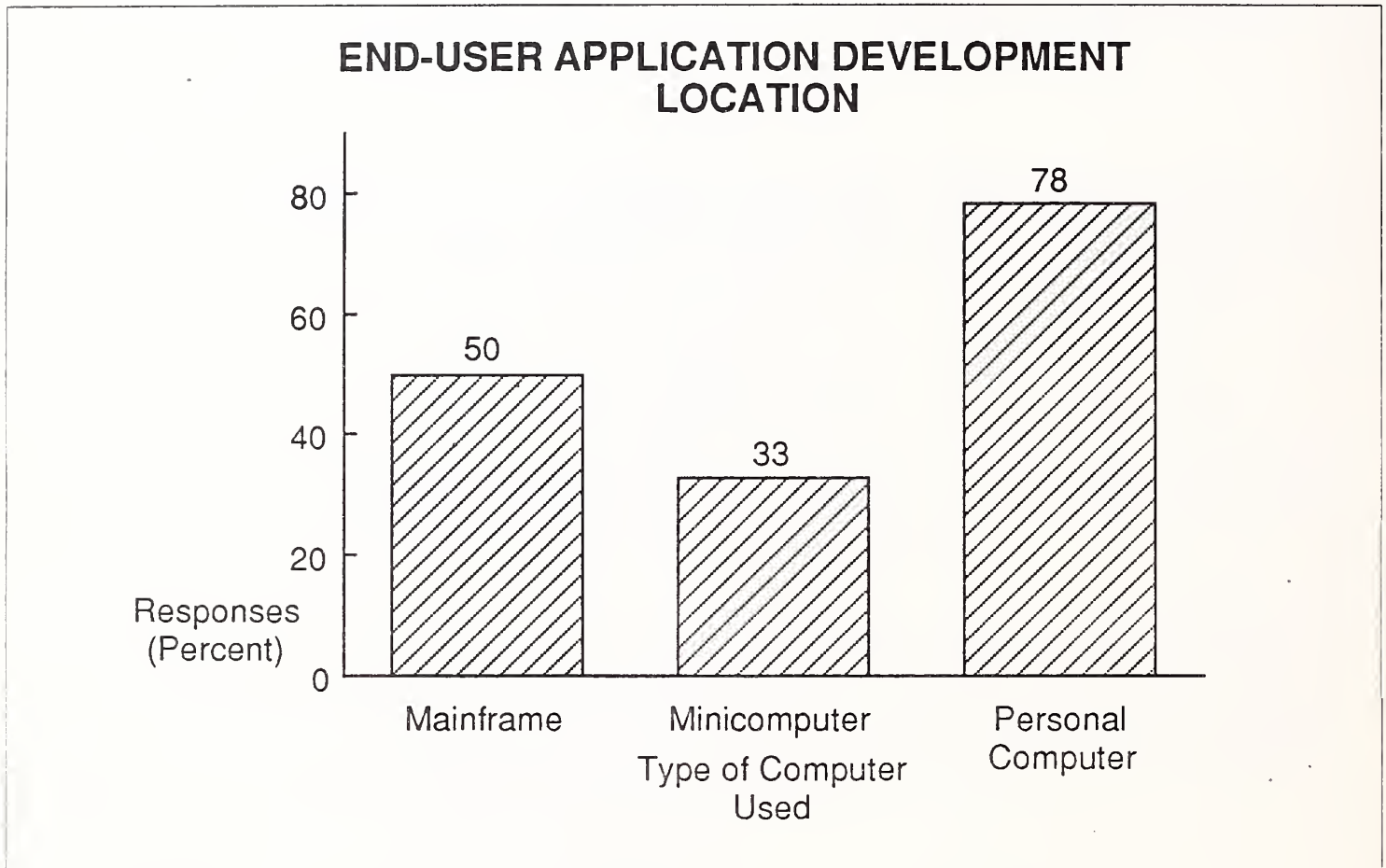


Exhibit V-7 indicates where this end user production activity is taking place. In many of the instances it is on two if not all three tiers of the network.

EXHIBIT V-7



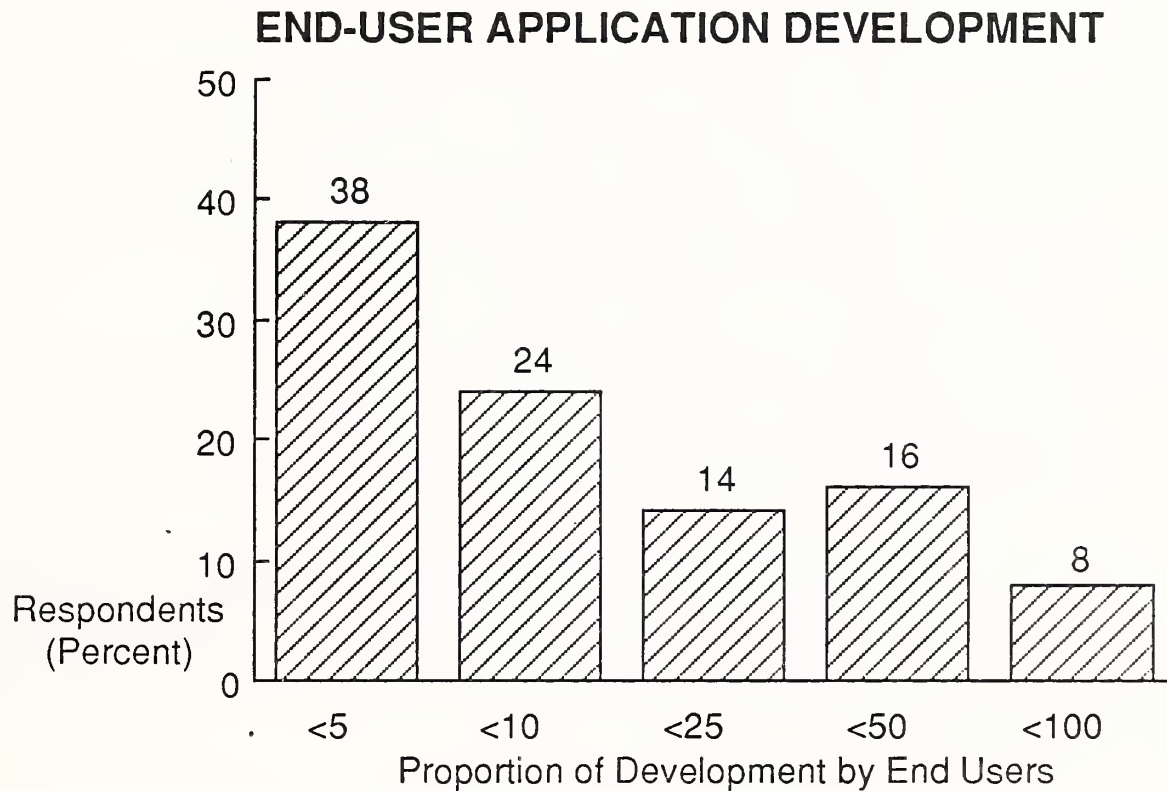
The trend to have end users developing production systems will continue to grow in importance. Exhibit V-8 shows that the magnitude of the end user development is measurable and significant.

- 24% (16% + 8%) of the responses indicated that more than 25% of all development is being performed by the end user.
- 8% indicated more than 50% of the development is being performed by the user.

While it must be noted that only 50% to 60% of the organizations interviewed indicated the end user was developing production systems, the data in Exhibit V-8 suggest that by the early 1990s at least 25% of all production systems will be designed and programmed by the end user. The information systems experience base of the using organization can

do nothing but expand, and with the transfer of IS professionals to user organizations the pace will quicken.

EXHIBIT V-8



4. Addressing Productivity and Quality

It has already been noted that IS is increasingly addressing the demand for applications through the use of external resources and package software. Internally IS is also striving to increase productivity, its number one issue.

The history of data processing is full of efforts to improve the quality and productivity of the development process. Structured design methodologies, laborious project management control systems, and fourth-generation languages have brought improvements as well as new problems. Today major new efforts are underway to apply the computer to the development process. Computer-Assisted Systems Engineering (CASE) is a major topic in the application development world.

INPUT finds that the move to CASE is proving to be slow and deliberate. The impacts of CASE on the development organization and underlying process can prove to be profound. A key requirement of CASE is the

disciplined use of development methodology and structured analysis processes. If the applications development staff has not learned to apply these techniques in a "paper fashion," implementing CASE with its increased discipline is not likely to succeed. The productivity and quality benefits will be not be achieved.

Exhibit V-9 shows the status of preparation for and progress with CASE.

- While 72% of the respondents indicated that they have the requisite development methodology in use, 56% of those are using "in-house" developed processes, which are often less complete and certainly less structured. It is also likely that the related use of structured analysis and design techniques are not fully disciplined nor in consistent use across the development staff.
- Some 24% of the organizations used CASE tools during 1988. However, almost without exception this use is in a pilot mode and limited to one or two projects. Only one organization indicated it was preparing to rule out CASE design tools for general use.

The cost/benefit trade-off with CASE will prove to be a long-lasting one. The cultural impact of CASE on the organization is immense and suggests a "go slow" approach is warranted. For an in-depth look at the CASE market and the progress in deploying CASE, see INPUT's report, *CASE Markets, 1988-1993*.

5. Data Base Management Function

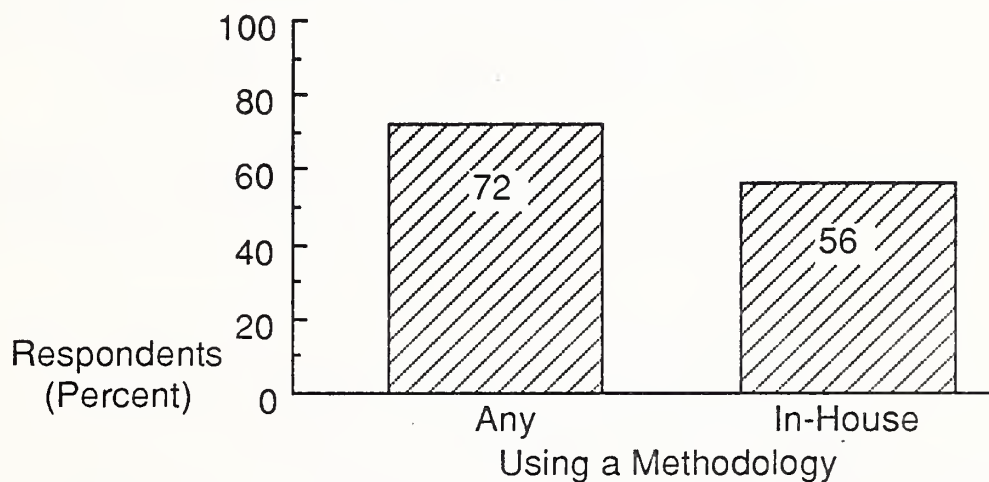
Research performed in 1988 by INPUT strongly suggests the role of the data management function is about to change significantly. Two factors are driving this need to change:

- First, the move to relational data base technology has reached a point where relational data base management systems (RDBMS) are becoming the dominant development environment for new applications. And RDBMSs are being deployed at all levels of the information network. (The level of use of RDBMS is covered in Chapter VII.)
- Second, the user is beginning to develop RDBMS-based applications. While it would be too early to suggest that end users truly understand data base technology, it is true that they are beginning to comprehend RDBMS adequately enough to proceed with the application development process. The growth in the use of RDBMS at the distributed processing level and the role the user is playing at this level of the network assures that the user will add data base concepts to his or her growing information systems experience base.

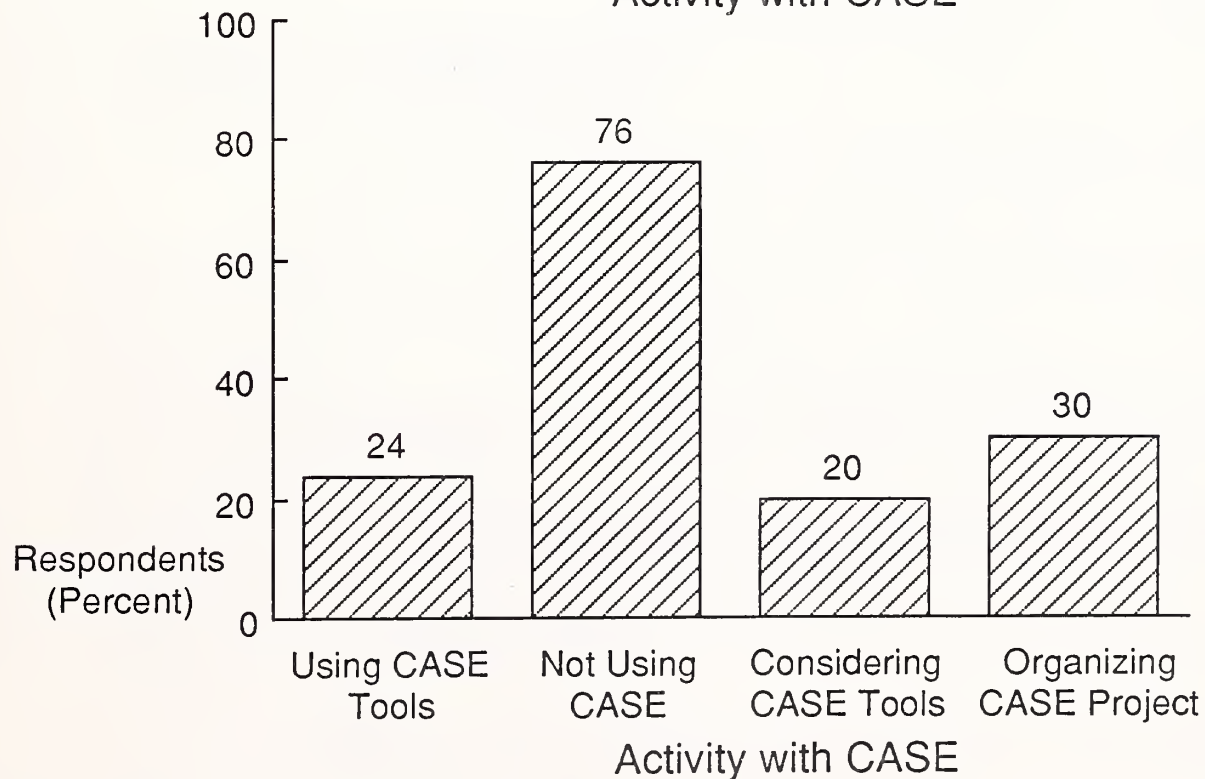
EXHIBIT V-9

SYSTEM DEVELOPMENT— ADDRESSING PRODUCTIVITY

Using Development Methodologies



Activity with CASE



The move to RDBMS and the expanding involvement of the end user needs to be positioned against the overall status of the Data Management function. Research performed for INPUT's 1988 report, *DBMS—Current Trends and Challenges*, provides the findings in Exhibit V-10 and V-11:

- Only 38% (34% + 4%) of the data administration managers interviewed felt their function was performing better than average, and 25% (7% + 18%) indicated effectiveness was worse than average. This truly indicates there is some need for added management attention and perhaps additional resources. See Exhibit V-10.
- Exhibit V-11 indicates the growing breadth of responsibility for data administration. No longer can the central data management function just address the data processed by the central mainframe data base systems.

INPUT has repeatedly stated that data management will continue to be a primary responsibility of the central IS organization. That responsibility covers the entire organization and information network; thus the central data management function must address data at all levels of the network, and expand to deal with all of the technologies used to process data in the network. For an in-depth look at this topic see INPUT's report, *Data Management—Current Trends and Challenges*.

EXHIBIT V-10

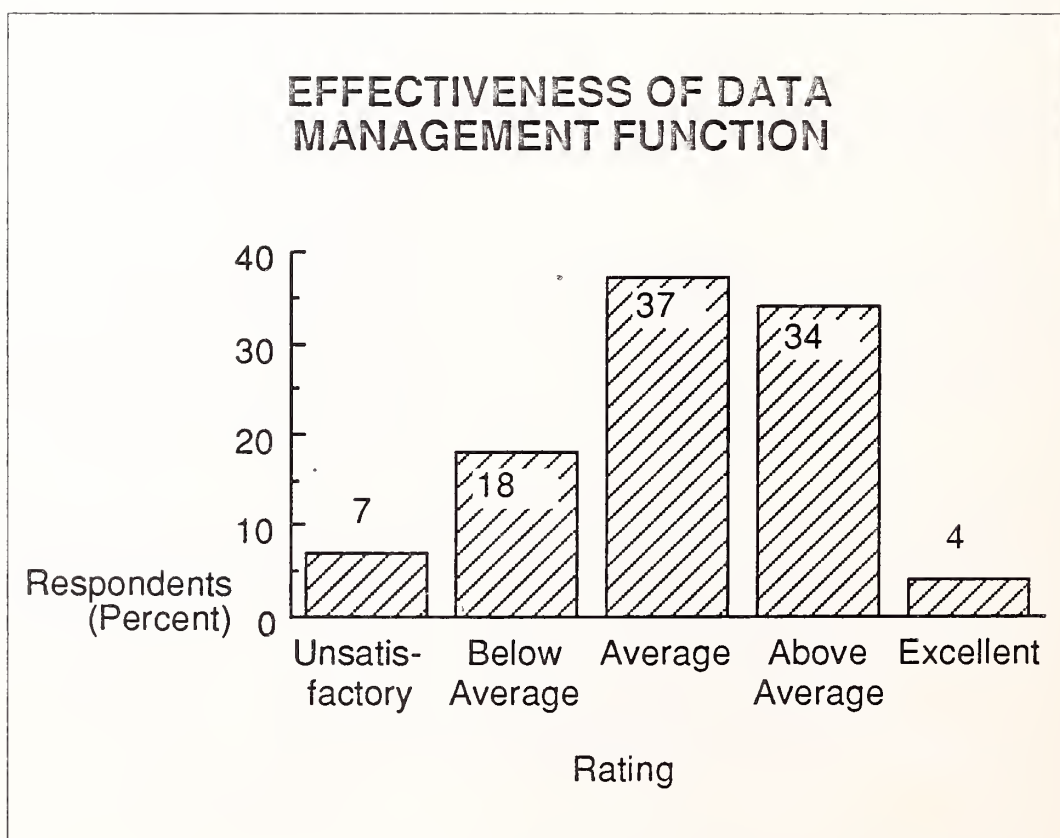
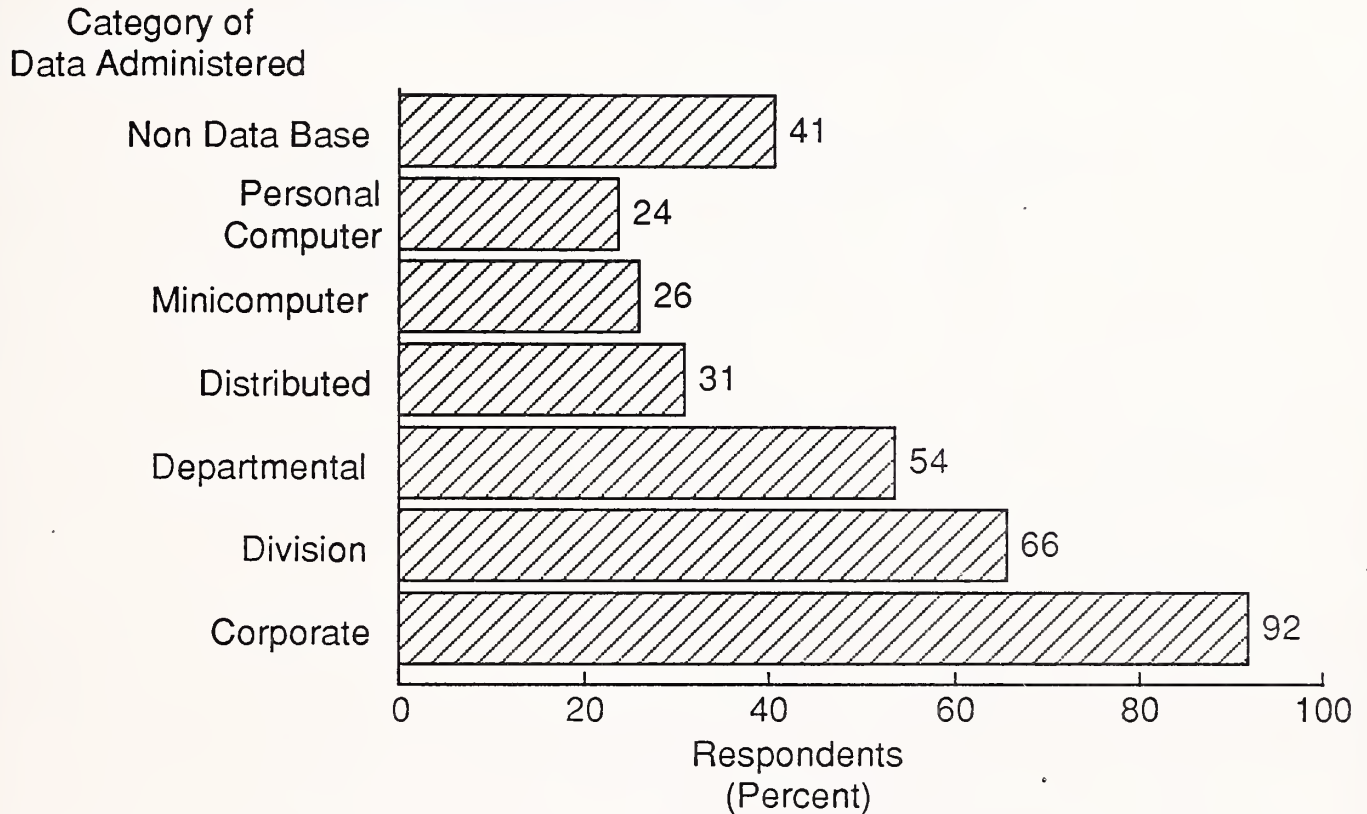


EXHIBIT V-11

DATA ADMINISTRATION BREADTH OF RESPONSIBILITY



D

Summary

The application development process, like the information systems function in general, is undergoing significant change.

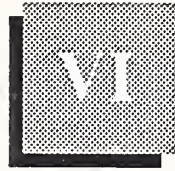
- It is struggling to adopt technology for improved productivity and quality of the systems it builds.
- The end user is becoming far more intimately involved, from the solution definition through development and implementation stages.
- The magnitude and complexity of protecting the installed application investment is casting a growing cloud over the function's productivity.
- Organizations are more often turning to outside sources for applications and solutions.
- The applications required for tomorrow are more often turning out to be significantly different than yesterday's.

It is time for applications development management to look introspectively at how it is doing its job, and determine what it does best versus what the user does best. The result will most likely be a different definition of responsibilities and methodologies for the 1990s and an increased focus on teaching the end user to become more self-sufficient in the application development process.



Information Systems Budget





Information Systems Budget

A

Controlling the IS Budget

It might be said that the Information Systems Budget is becoming an enigma. It is no longer a realistic indicator of the magnitude of activity in the information systems area. It does not correlate well with the market growth experienced by the information systems vendors. And it does not reflect the attention paid to information technology by senior management.

More and more the traditional analysis and use of the IS budget as a projector of the future and as a comparison basis with other organizations are proving to be uninformative and possibly misleading.

- While IS budgets are growing on average about 5% annually, the market is growing as much as three times as fast. INPUT's forecast for the Information Services market (processing services, software products, professional services, etc.) is for about 18% average annual growth for the next five years.
- The IS budget content now varies significantly for many organizations. Some include voice communications and some do not, and more important, a growing number of IS budgets do not include expenditures by the end user community.
- Growth rates within an industry vary significantly, depending on the investment management is currently making in IS.

Against this background, INPUT surveyed over 200 IS organizations to gain traditional and new insights into the information systems budget and the changes taking place. INPUT's questionnaire gathered data on 1987 and 1988, as well as projections for the 1989 IS budgets. The 1989 projections were gathered for the most part before actual budgets had been developed.

Exhibit VI-1 summarizes the responses to a question asking for the three most significant factors affecting IS budgets for 1988 and 1989.

EXHIBIT VI-1

FACTORS AFFECTING INFORMATION SYSTEMS BUDGETS

(Percent)

| Factor | Proportion of Responses | |
|---------------------|-------------------------|------|
| | 1988 | 1989 |
| Costs of Technology | 39 | 44 |
| Company Specific | 23 | 22 |
| Staff Costs | 16 | 13 |
| Organization | 6 | 5 |
| Major Projects | 6 | 6 |
| Economy | 4 | 5 |
| Industry Climate | 4 | 4 |
| Competition | 1 | 1 |

- The “costs of technology” is clearly the leading factor impacting the IS budget. Lower costs of hardware (on a price/performance scale) are not lessening the pressure to invest and deploy more quickly.
- The second most mentioned factor, “company specific,” reflects the growing importance of the way the IS budget is following the overall business situation of the organization served. No longer does the IS budget automatically go up 10% or more while other budgets are constrained. Today’s bottom line focus on IS places its budget in exactly the same light as other operating budgets.
- The relatively low impact of general economic and industry climate situations further reinforces the growing internal focus of the IS budget and its direction.

The annual growth of Information Systems budgets has averaged 4% to 6% for a number of years and can be expected to stay that way for the foreseeable future. One of the elements leading to this growth rate has been the increasing proportion of IS expenditures by the business units and using departments. Exhibit VI-2 indicates that today's central IS budget includes a declining proportion of the organizations' total IS expenditures. The first chart shows that:

- Only 57% of the organizations surveyed include the IS budgets of operating divisions and subsidiaries in the central IS budget.
- And more important, 39% *do not include* end user computing expenses in the central IS budget. This 39% is an indication of a trend to move the IS expenditures to the departmental level where the expenses are actually incurred.

The second portion of Exhibit VI-2 indicates the magnitude of the impact of the end users' and operating divisions' expenditures on the IS budget.

- If the operating division IS expenditures are included, they account on average for 44% of the total budget.
- If the end user computing IS expenditures are included, they account for 42% of the budget.

EXHIBIT VI-2

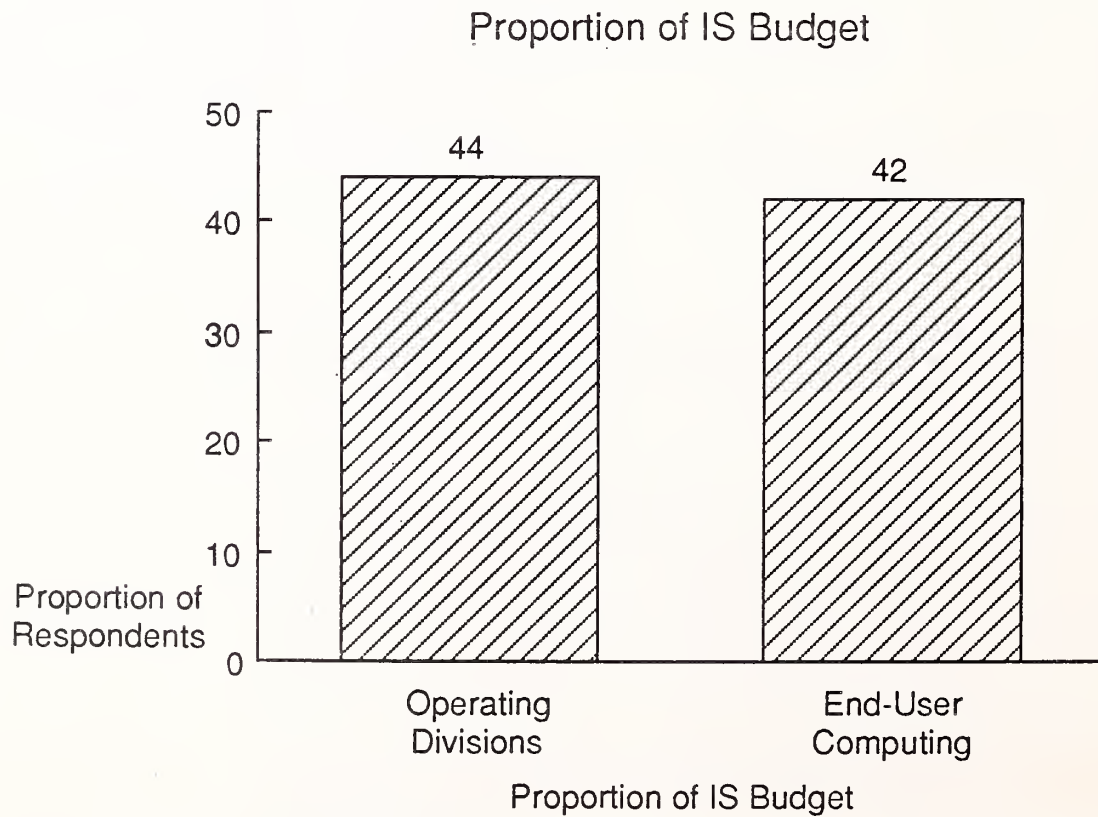
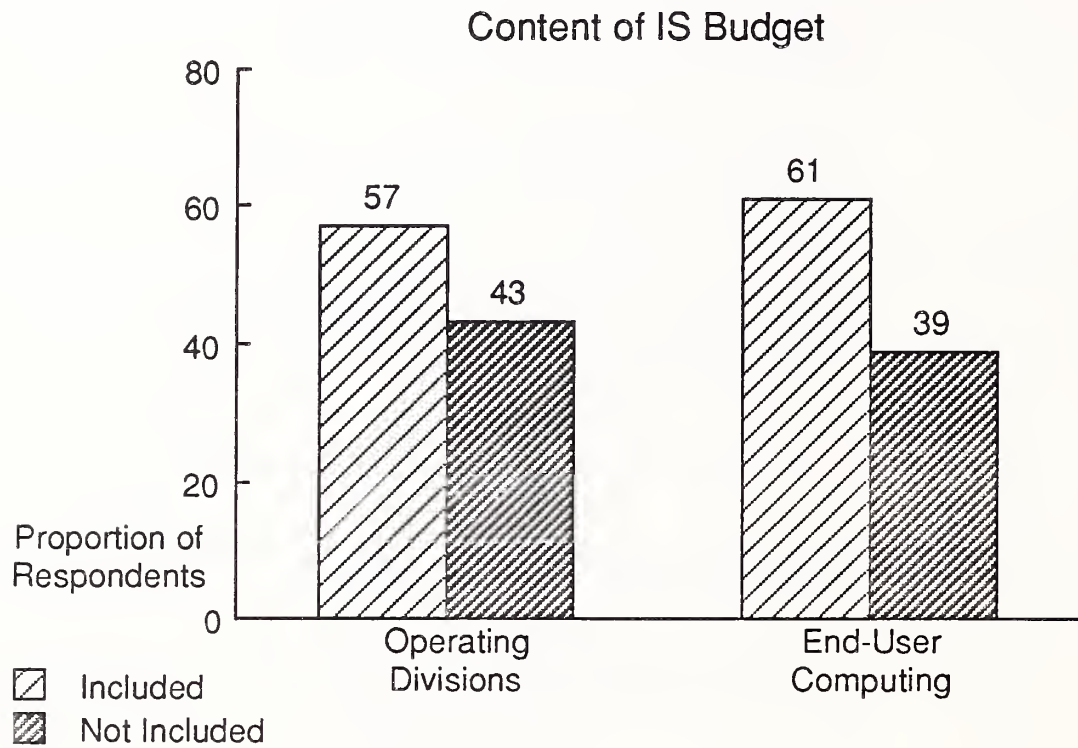
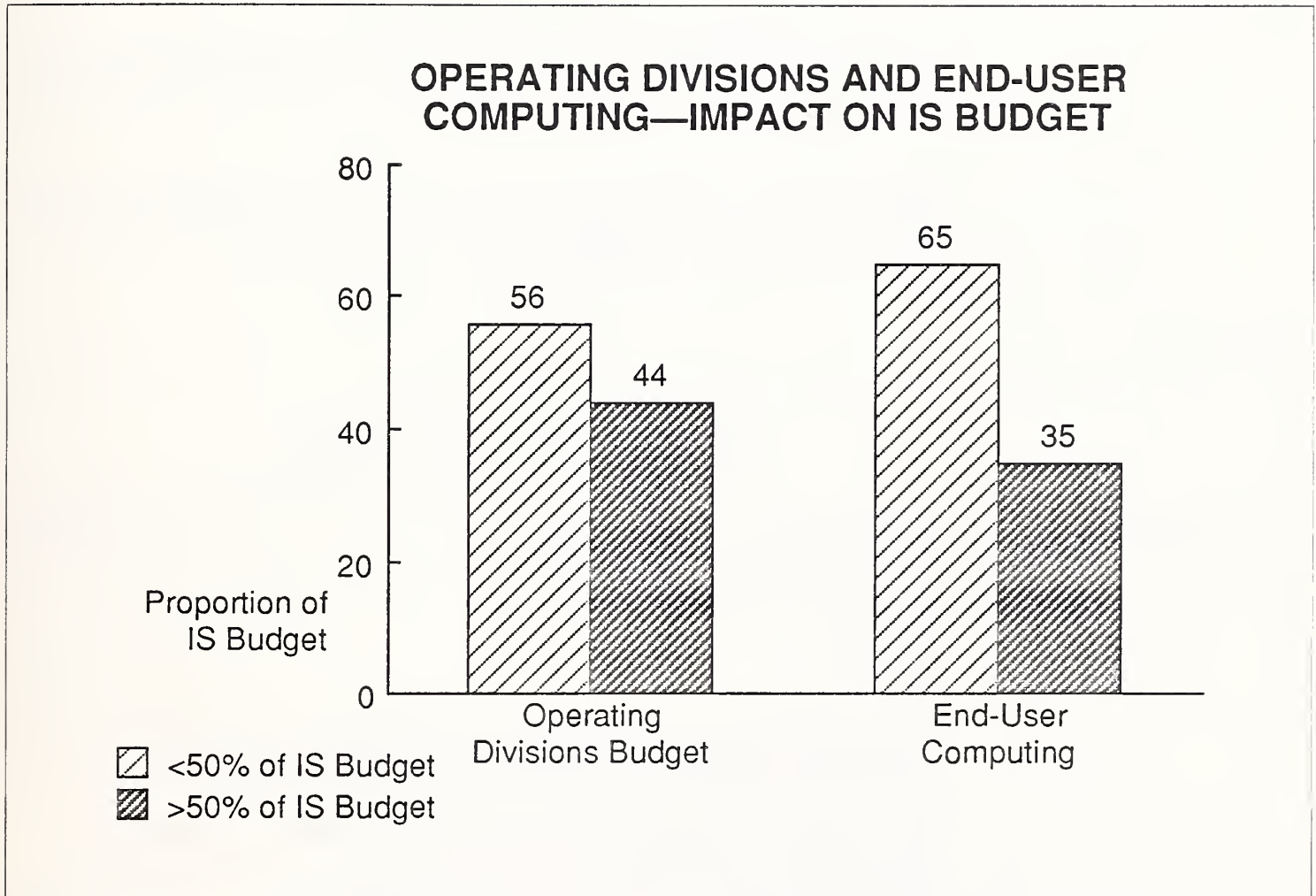
SCOPE OF THE INFORMATION SYSTEMS BUDGET

Exhibit VI-3 provides a closer look at this trend. For 44% of the organizations, operating divisions account for over 50% of the IS budget. And the same is true concerning end user computing for 35% of the organizations.

EXHIBIT VI-3



There is little doubt that the IS budget is being driven to an increasing degree by the decentralized portions of the IS program. Furthermore, it can be expected that organizations will continue to transfer the budget to the direct control of the operating and user departments. The result will be less direct involvement by the central IS organization, which will perform more of a monitoring and major expenditure review process. For many organizations this change is already underway.

B

Budget Analysis

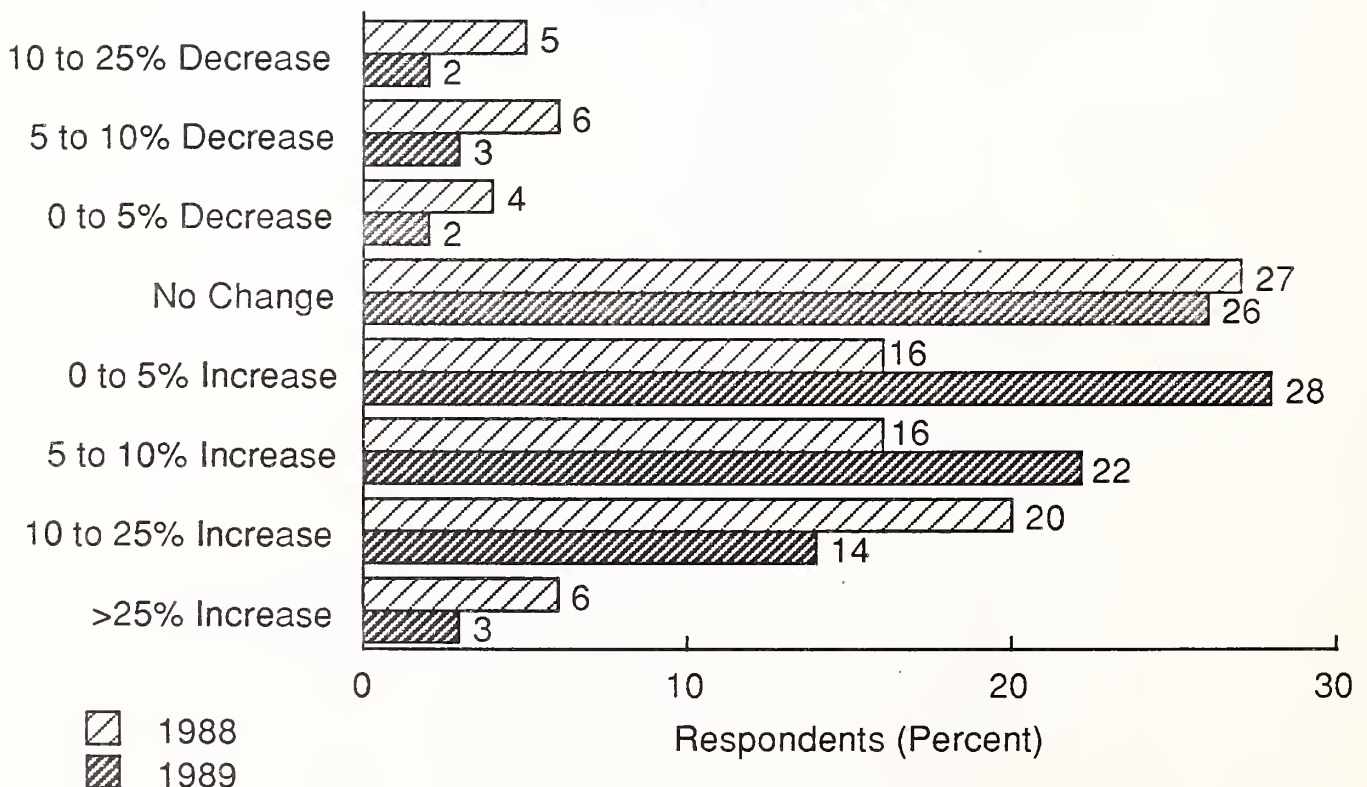
INPUT's IS budget analysis for 1988 indicates continued budgetary constraint at the central IS organization. For 1988, as compared to 1987, there was a modest 4.6% growth rate and for 1989 the projection is an only slightly higher 5.3%. These findings are well in line with other industry analyses. The central IS budgetary constraint of the past five or more years will continue into the early 1990s.

The task is to manage the central IS budget with more care and to continue the transfer of segments of the budget from IS to the using organization.

Exhibit VI-4 provides a distribution of the overall IS budget growth rates for 1988 and 1989. A wide disparity is found, ranging from a greater than 25% decrease to increases of the same magnitude.

EXHIBIT VI-4

INFORMATION SYSTEMS BUDGET GROWTH RATES



As the exhibit shows the number of respondents with decreasing budgets declined from 15% to 7% from 1988 to 1989 indicating a more positive outlook for 1989. On the other hand, those with large budget increases (above 10%) also declined substantially. Concentration in 1989 appears much greater in the steady growth area of 0-10%. With inflation and labor cost increases this represents little real growth.

Exhibit VI-5 breaks the IS budget into its primary categories and provides the 1987 and 1988 distribution of the total budget among categories as well as respective growth rates for 1988 and 1989.

Note: For each of the budget exhibits in this chapter, the 1987 and 1988 budget and growth figures are based on actual budgets for two years while the 1989 growth figures are estimates made during the interview with respondents. In many instances, the 1989 budgets had not been finalized at the time of the interview.

The most significant increase in 1988 is in Communications at 14%. The remainder of this section will look at the findings for each of the four categories.

EXHIBIT VI-5

INFORMATION SYSTEMS BUDGET DISTRIBUTION AND GROWTH

(Percent)

| Category | Distribution | | Growth | |
|------------------------------|--------------|------|--------|------|
| | 1987 | 1988 | 1988 | 1989 |
| Personnel | 40 | 39 | 2 | 2 |
| Computer Hardware | 28 | 28 | 5 | 4 |
| Communications | 11 | 12 | 14 | 6 |
| External Products & Services | 16 | 16 | 5 | 2 |
| Other | 5 | 5 | 5 | 0 |
| TOTAL | 100 | 100 | 4.6 | 5.3 |

An analysis by size of IS budgets indicates that:

- Budgets in the \$5 to \$10 million range are growing at about half the rate of the norm: 2% to 3%.
- Budgets in the \$25 to \$50 million range were unchanged in 1988 and will grow an average of 7.5% in 1989.
- Budgets below \$5 million and above \$50 million are growing at 5% to 6% annually.

1. Personnel

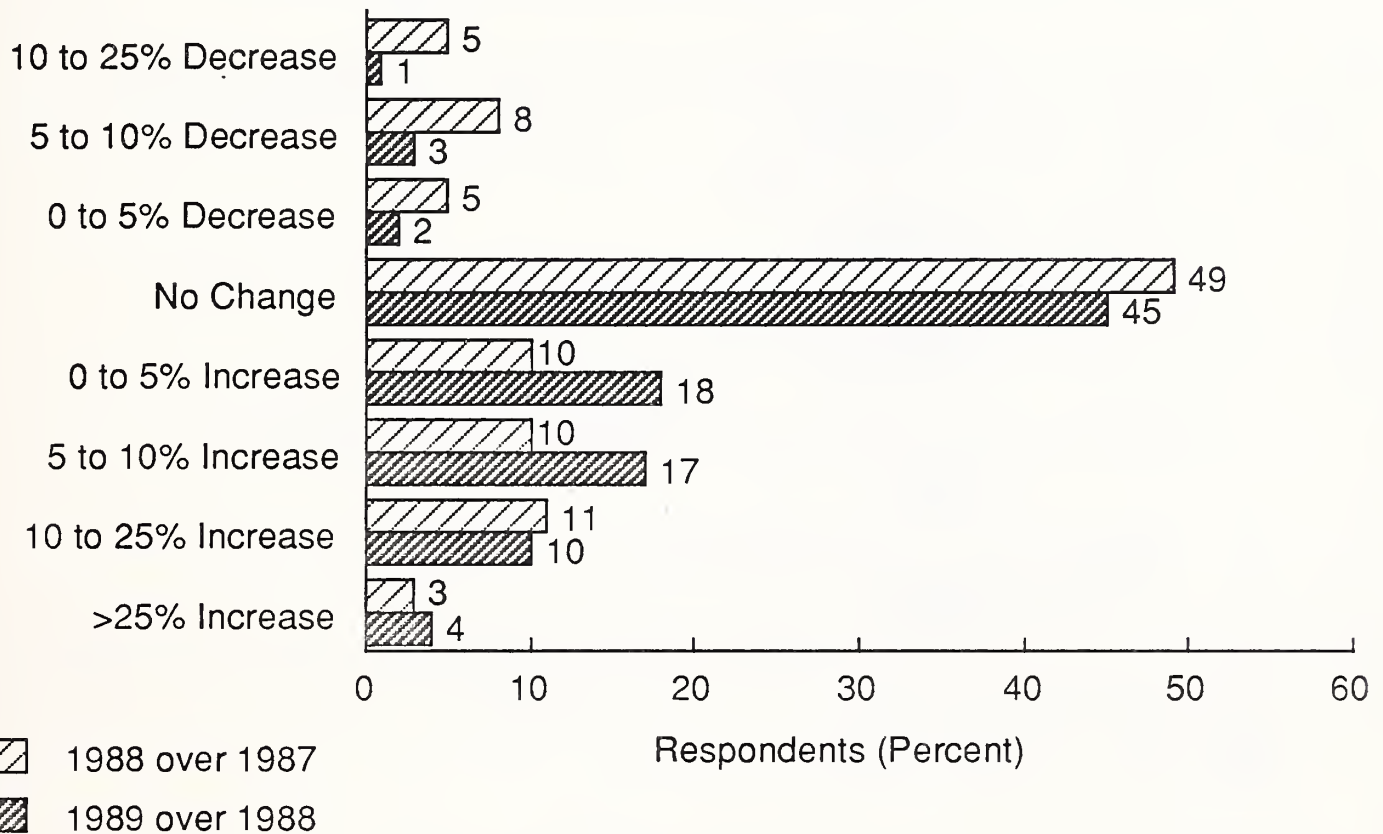
The staffing levels of most IS organizations have been relatively stable for some time. Reducing staff, or at least not adding any, has been an essential approach to constraining the IS budget. In general, the addition of IS professionals has been within the user environments or tied to end user programs.

Those organizations surveyed by INPUT indicated that there was no change in staffing levels on average in 1988. At the same time they did indicate an expectation of a modest 4% to 5% staff growth in 1989.

- Exhibit VI-6 shows a distribution of the changes in IS staffs for 1988 and 1989.

EXHIBIT VI-6

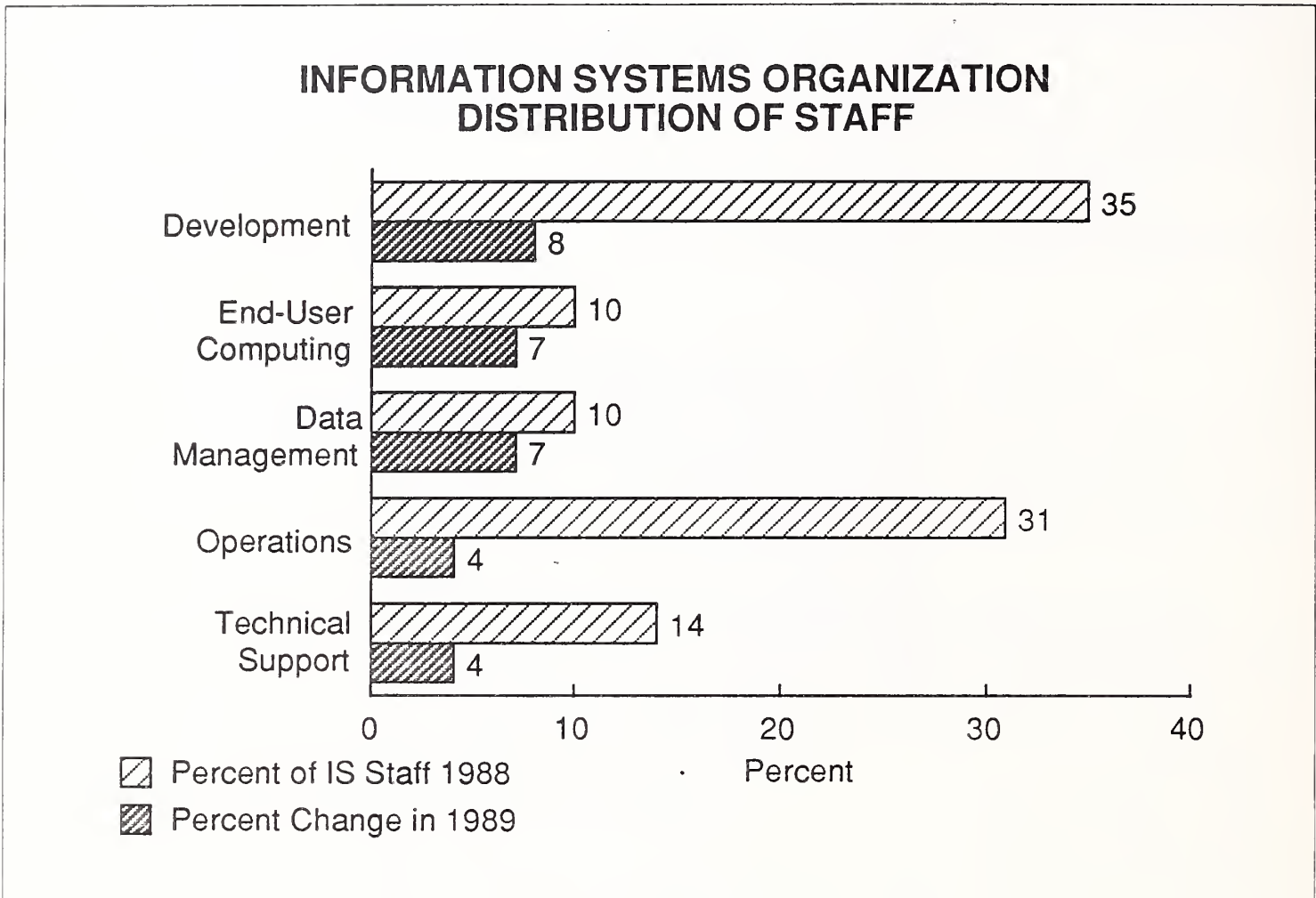
INFORMATION SYSTEMS ORGANIZATION CHANGES IN STAFF LEVELS—1988 AND 1989



- Exhibit VI-7 provides an assessment of the IS staff by function indicating the proportion allocated to each function and the projected growth for 1989. INPUT believes the additions in the Data Management function are dearly needed.
- This chart also highlights that on average, IS now allocates 10% of its staff to the end using computing function.

The personnel budgets reflect only 2% growth for both 1988 and 1989. On average IS management has projected a 4% to 5% staff increase. And Exhibit VI-7 suggests an overall 6% increase for all functions. Whatever the actual increases in IS staff in 1989, they will be modest at best. What is more likely will be a continued movement of staff to using departments with small increases in specialist areas such as data management and end-user support.

EXHIBIT VI-7



2. Computer Hardware

The Computer Hardware budget continues to lumber along at a modest pace. Overall the hardware budget is growing 4% to 5% annually and can be expected to do this for the foreseeable future.

Exhibit VI-8 provides the distribution of the Computer Hardware budget for 1987 and 1988, and the respective growth rates for 1988 and 1989. In 1988, the most significant growth was, not unexpectedly, in the personal computer area (17%), which also has the highest projected growth for 1989. Workstation expenditures are expected to head the hardware budget priority list for the next few years.

At the same time, minicomputers experienced a decline of 8%.

EXHIBIT VI-8

COMPUTER HARDWARE BUDGET

(Percent)

| Category | Distribution | | Growth | |
|--------------------|--------------|------------|----------|----------|
| | 1987 | 1988 | 1988 | 1989 |
| Mainframes | 43 | 44 | 7 | 4 |
| Minicomputers | 16 | 14 | -8 | 2 |
| Personal Computers | 9 | 10 | 17 | 6 |
| Mass Storage | 16 | 16 | 7 | 1 |
| Other | 16 | 16 | 7 | 1 |
| TOTAL | 100 | 100 | 5 | 4 |

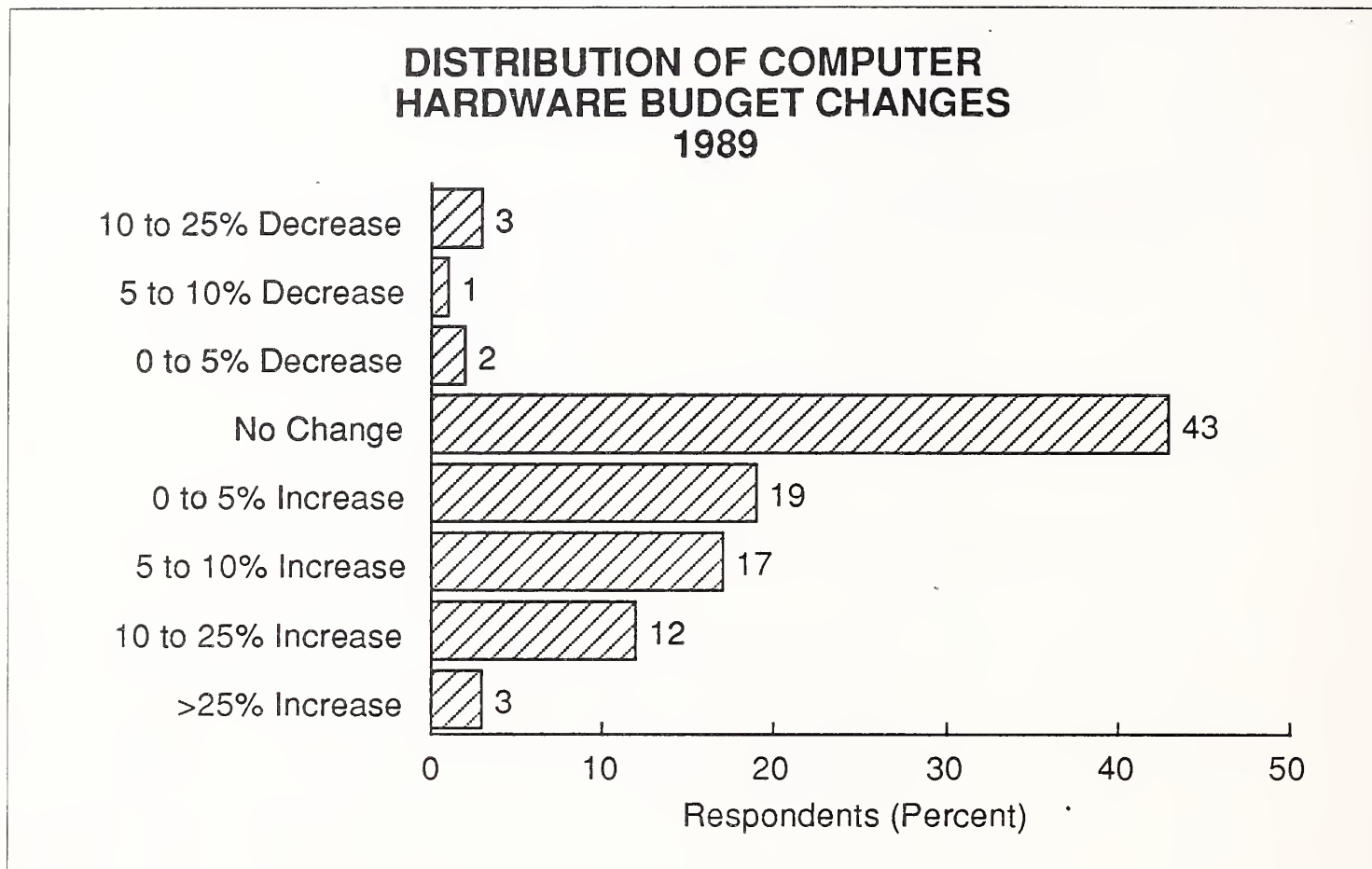
As shown in Exhibit VI-9, over 60% of the respondents project No Change or an increase of no more than 5% in their computer hardware budget growth for 1989.

3. Communications

INPUT found that essentially half of the IS budgets include the Voice Communications budget and half do not. Control of voice communications costs often continues to be an administrative function; however, the influence of IS on the voice communications segment will continue to grow.

In 1987, Communications was the fastest growing segment of the IS budget, and it is projected to continue to grow in 1989 and beyond. Despite efforts to contain the costs of expanding networks, demands for integration of the network will drive this segment of the IS budget to a higher growth rate than the budget as a whole. In addition, it is one of the IS expense categories that will remain significantly under the control of the central IS function regardless of the level of decentralization of IS in general.

EXHIBIT VI-9

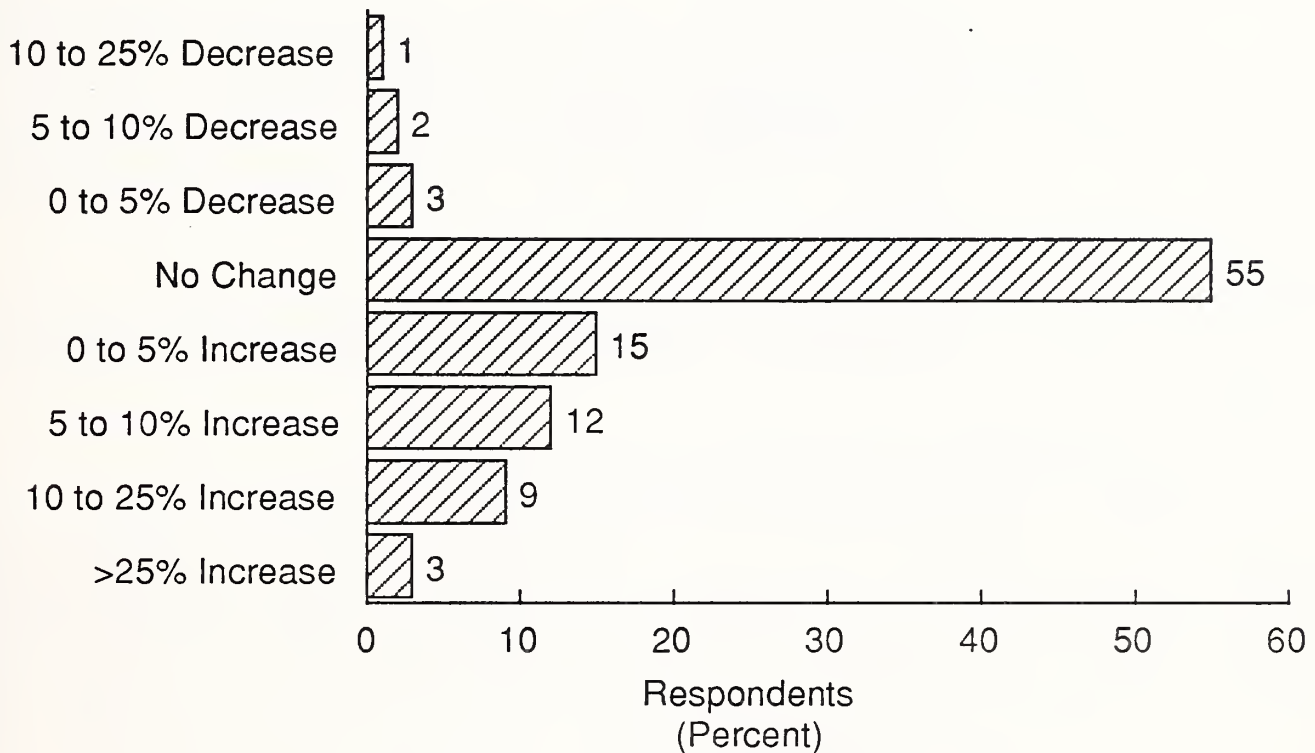


- The Communications segment of the IS budget grew, on average, 14% in 1988.
- The projections indicate a further, although smaller, increase of 6% in 1989.

Exhibit VI-10 provides a distribution of the projected Communications budget growth rates for all organizations in 1989. The concentration is centered on No Change from the 1988 level, a major cause of the decline to a 6% average increase.

EXHIBIT VI-10

DISTRIBUTION OF COMMUNICATIONS BUDGET CHANGES 1989



4. External Products and Services

The external services and products segment of the budget today holds the most interest and year-to-year change. While the total growth for 1988 was only 5%, there are some significant impacts. Exhibit V-11 provides the breakdown of this budget.

- INPUT believes the 1989 growth rates are understated. This is the segment of the budget that is finalized last and can be significantly impacted by user-driven decisions to go to outside services and resources. Also many expenditures are not budgeted, but occur during the year.
- The large growth (13%) in 1987 in Professional Services reinforces the findings in Chapter V on Development Sourcing, which indicate that IS is increasingly turning to external resources for development services. INPUT projects that this growth (perhaps at a somewhat slower rate) will continue in 1989 once the budgets are finalized. These funds will most likely come at the expense of adding additional internal IS staff.

- The small growth in hardware maintenance expense is tied directly to the price-competitive nature of this industry sector. This competitiveness is exemplified by IBM's move to provide lower cost maintenance charges throughout its hardware product line. This is one budget category where IS is experiencing some relief, although increasing maintenance costs for intelligent workstations are expected.
- While hardware maintenance costs are under control, external software maintenance costs are not. They increased 13% on average in 1988 and are likely to increase again in 1989. The tendency to buy more application software, and the fast growth in the use of development and systems control software products will continue to drive this expense category.

EXHIBIT VI-11

EXTERNAL PRODUCTS AND SERVICES BUDGET

(Percent)

| Category | Distribution | | Growth | |
|-----------------------|--------------|------------|----------|----------|
| | 1987 | 1988 | 1988 | 1989 |
| Professional Services | 13 | 14 | 13 | 0 |
| Processing Services | 5 | 5 | 5 | 1 |
| Application Software | 15 | 15 | 5 | 0 |
| Systems Software | 18 | 18 | 5 | 1 |
| Turnkey Systems | 3 | 3 | 5 | 0 |
| Hardware Maintenance | 25 | 24 | 1 | 2 |
| Software Maintenance | 14 | 15 | 13 | 2 |
| Other | 6 | 6 | 5 | 0 |
| TOTAL | 100 | 100 | 5 | 2 |

Exhibit VI-12 provides the distribution of growth rates. The distribution is similar to that of other categories; however, portions of this budget category are subject to the most change as priorities are revised and decisions are made to use outside sources for products and services.

EXHIBIT VI-12

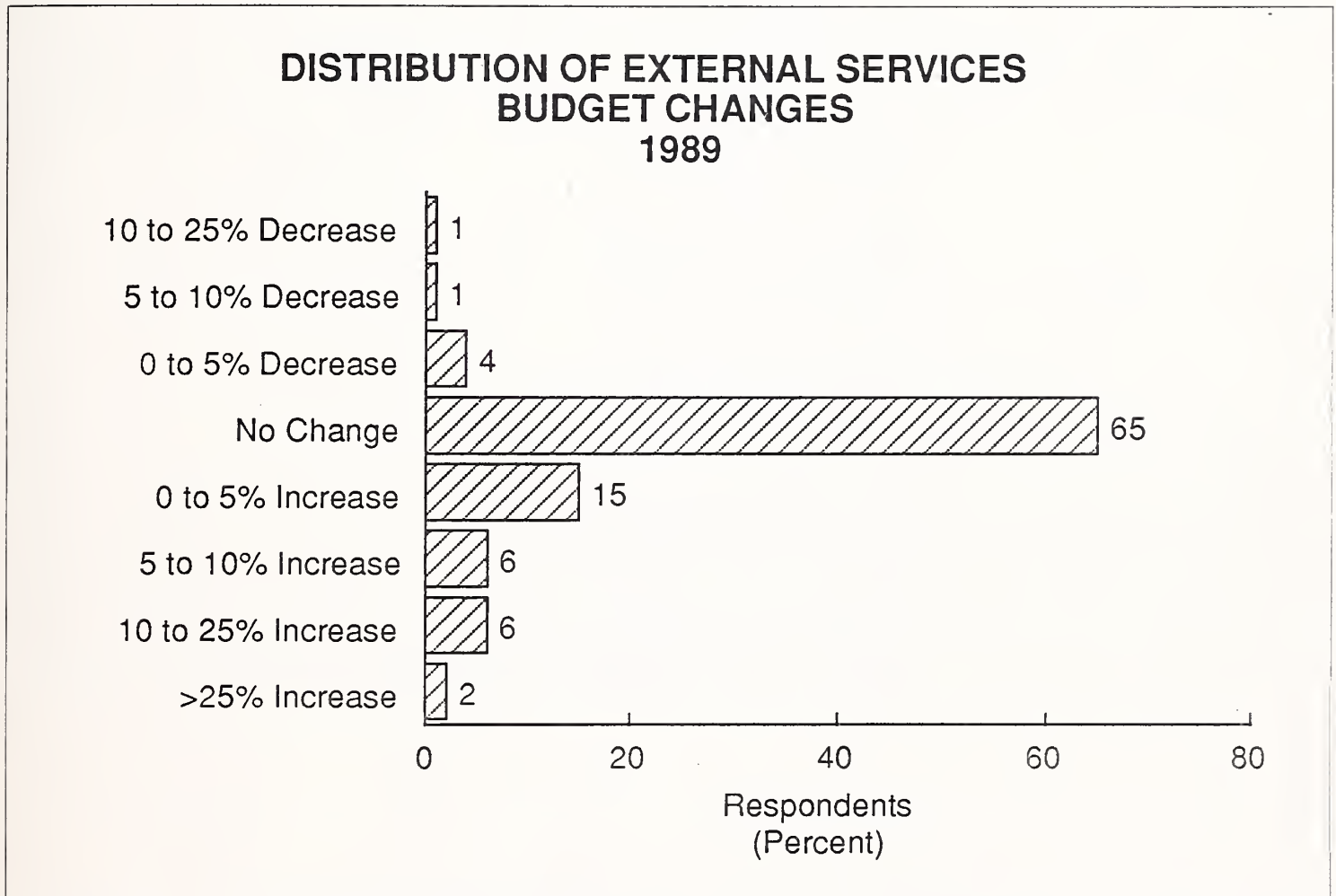


Exhibit VI-13 provides a comparison between the budget growth rates determined through research for this report and the actual growth experienced by vendors based on INPUT's vendor research. As can be seen, the market growth routinely exceeds that of the IS budget. The differences are primarily due to the user acquiring information technology directly instead of through the IS budget.

EXHIBIT VI-13

EXTERNAL PRODUCTS AND SERVICES IS BUDGET GROWTH VERSUS MARKET FORECAST

(Percent)

| Category | 1988 Budget Growth | 1988 vs. 1987 Revenues |
|-----------------------|--------------------|------------------------|
| Professional Services | 13 | 16 |
| Processing Services | 5 | 12 |
| Application Software | 5 | 19 |
| Systems Software | 5 | 21 |
| Turnkey Systems | 5 | 11 |
| Hardware Maintenance | 1 | 9 |
| Software Maintenance | 13 | 9 |

C

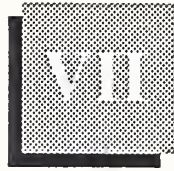
Summary

INPUT's 1988 budget analysis points to the following conclusions:

- The total/central IS budget represents a declining proportion of the total IS expenditures of an organization. More and more of the budget is contained directly in the users' budget.
- Growth rates will continue to remain modest for the central budget.
 - Staff increases will be minimal. Increases are most likely in data management and end user computing support.
 - Hardware growth will be centered in workstations.
 - Communications budgets will grow faster than the total budget.
 - External Products and Services will likely increase in 1989 as they did in 1988. This category is increasingly under the control of the user budget.



Impact of New Technology



Impact of New Technology

A

Planned Computing Technologies

In this and last year's Information Systems Planning Reports, INPUT has classified the technology topic as both a driving force and a major issue. In Chapters III and IV of this report INPUT noted the following:

- Driving Force: Expanding Wealth of Technology
- Major Issue: Managing the Technology Investment

Today the information systems manager is challenged to pick the best technology from a proliferation of options. At times the selection process is perplexing and is usually a major hurdle. The vendor community is expanding the possibilities, the end user is voicing opinion and preference more strongly, and the IS manager is struggling to pick the best solution against a requirement for integration and connectivity within the information network.

To gain insight into the preferences and priorities being applied to new technologies, INPUT's survey asked each organization to list the three new technologies currently planned for future deployment. Exhibit VII-1 summarizes the results.

EXHIBIT VII-1

PLANNED NEW TECHNOLOGIES

| Category | Proportion of Responses (Percent) |
|--|-----------------------------------|
| Voice, Image, and Optical Data Entry and Storage | 21 |
| LANs and Integrated Distributed Processing | 13 |
| Networking and Connectivity | 12 |
| Intelligent Workstations | 11 |
| CASE and Related Application Development | 10 |
| Application Solutions | 9 |
| AI and Expert Systems | 8 |
| Data Base Management Systems | 8 |
| Electronic Data Interchange | 4 |
| Office Systems | 3 |

The responses were spread across 10 categories that exemplify both the challenge and the opportunity confronting IS management.

- No single category dominates the list, emphasizing the breadth of technology available as the 1990s approach.
- The responses range from new emerging data entry and storage technologies, such as image processing and voice recognition, to the long standing challenge of providing office systems.
- The second and third most mentioned categories deal with the major issue of integration. As noted earlier, the drive to integrate the now dispersed and distributed information network of today's large organization must be a major priority for information systems management.

- Four of the categories are the subject of active research by INPUT. They are Intelligent Workstations, CASE, Data Base Management Systems, and Electronic Data Interchange.

B

Intelligent Workstations

In the early part of 1988, INPUT's Information Systems Program published a four-part series, *Workstation Strategies*. These findings were an in-depth look at the changing world of the standard business workstation as it goes through a major evolution from the "dumb terminal" to being a computer in its own right.

This evolution started with the introduction of the personal computer and is now being driven by the developers of intelligent workstations such as Sun and Apollo. It is also being driven by the introduction of OS/2 by IBM and by the end user's demand to access the full information network through a single interface.

INPUT's findings include:

- The PC population now exceeds that of the traditional computer terminal. In 46% of the organizations interviewed, the PC population exceeded 50% of the total workstation population.
- The PC has placed access to the information network on the desk of managers and professionals. Managers and professionals have 79% of the personal computers, but only 34% of the terminals.
- Sixty-two percent of the PCs are connected to the network, 85% of those directly into the mainframe network (as opposed to a LAN or minicomputer).
- Examples were found where the power of the engineering style of the intelligent workstation is being adapted to business applications. The powerful communications and processing capabilities of Sun Microsystems' workstations, and others, are finding applications in the business environment as IS strives to deal with integration and connectivity.

The trend toward a computer as the business workstation portends a major opportunity to change the way many business applications are designed and implemented. Exhibits VII-2 and VII-3 suggest that applications can be designed so that subfunctions can be located at the most appropriate tier of the network while the application remains integrated in its operation.

EXHIBIT VII-2

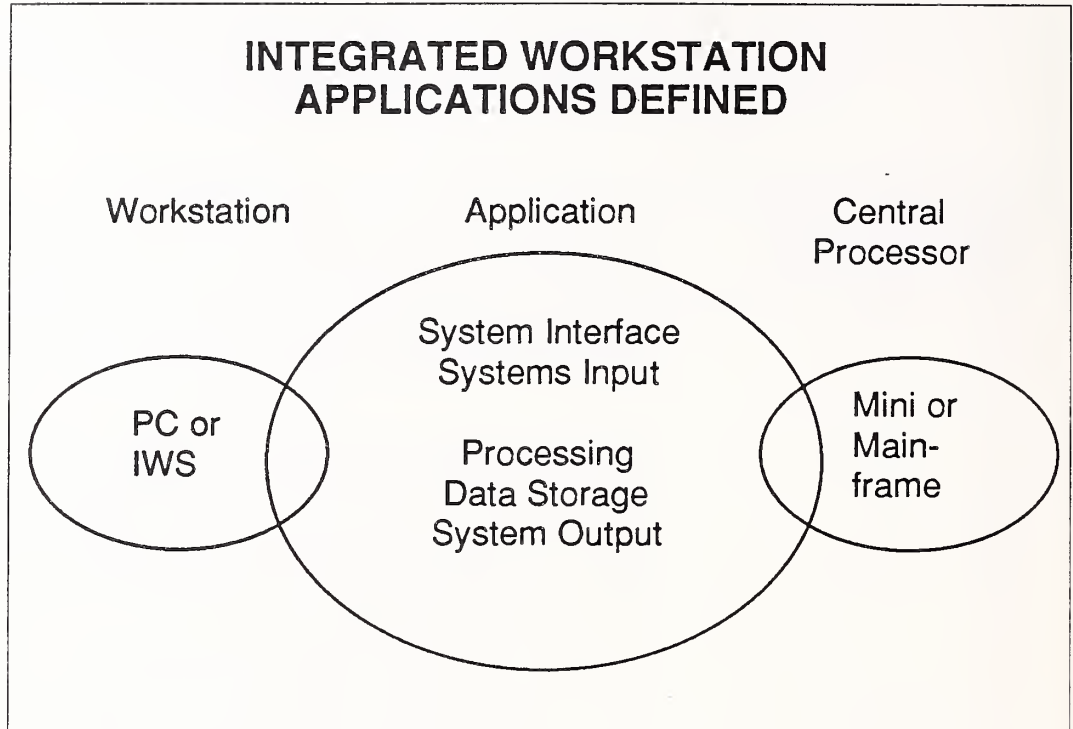


EXHIBIT VII-3

**INTEGRATED WORKSTATION APPLICATIONS
DISTRIBUTION OF FUNCTIONS**

| Workstation Functions | Central Processor Functions |
|----------------------------|--------------------------------|
| User Interface | Main File Maintenance |
| Data Entry and Maintenance | Application Network Management |
| Secondary Data Management | Primary Data Management |
| Current Activity | Primary Systems Output |
| Analysis and Reporting | Weekly, Monthly Processing |

Much remains to be learned about using a computer as "the window to the network," but INPUT is confident that this evolution is underway and must be grasped, managed, and used by IS for the success of future information systems strategies.

C

Networking, Integration, and Distributed Processing

The second and third categories in Exhibit VII-1 relate to the critical priority of integrating the network. Integration of data, technology, and applications is one of the six major issues discussed in Chapter IV. Next to maintaining the existing applications portfolio, nothing is attracting the attention of IS management more than connecting the network that IS has spent the past few years distributing.

The tools to accomplish this integration are becoming more available, driven by creative software developers and the increasing emphasis on and support for standards. The next few years will see major improvements in this area.

INPUT forecasts the Systems Control segment of the software products market as the fastest growing segment, exceeding applications, application development tools and operating systems. The challenge is to connect computer A to computer B regardless of the differences in their protocols. A great deal of third-party vendor creativity is being successfully applied to this challenge, offering IS tools to support the integration process. This area will remain a priority well into the 1990s.

D

Data Base Management Systems

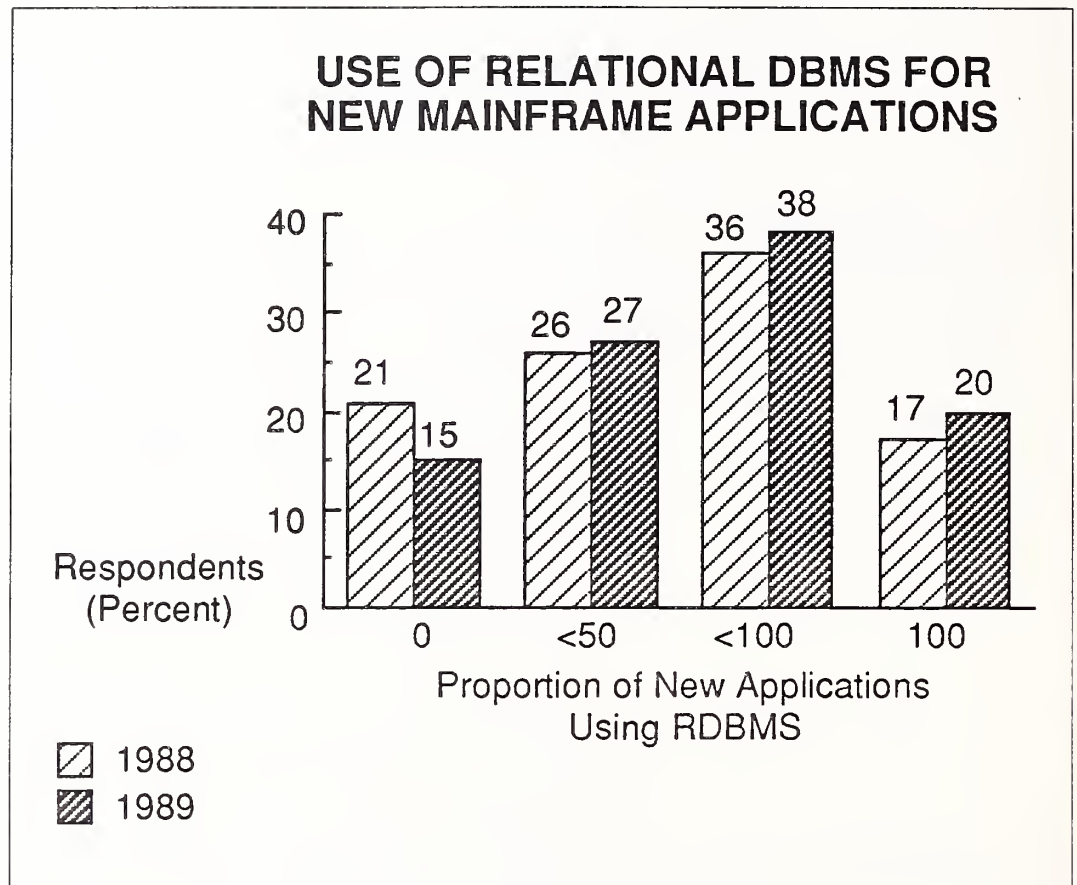
The move to relational data base technology is in full swing. INPUT found in its Data Administration survey that a majority of the organizations are using a Relational DBMS.

- 61% reported that IS was using RDBMS, while 37% indicated end users were using RDBMS technology.
- The dominant use was in the mainframe environment, which attests to the success by IBM with DB/2 in the past two years. Seventy-five (75%) percent of current RDBMS development is on the mainframe.

Exhibit VII-4 indicates the aggressiveness with which relational data base technology is being deployed.

- 26% of the respondents indicated that up to 50% of new applications developed in 1988 would be with RDBMS, while 36% indicated RDBMS use would be greater than 50% and 17% indicated all new applications would use a RDBMS.
- The findings indicate that RDBMS usage will grow further in 1989.

EXHIBIT VII-4



Of perhaps greater importance are the areas in which RDBMS-based applications are used. Exhibit VII-5 indicates Management Reporting and Operations received the most frequent mention. While Management Reporting is to be expected, the use of RDBMS in operational systems and in the next category, Company Specific, is a further indication of the coming of age for relational technology.

The relational age is here and will receive major focus over the next five to ten years.

EXHIBIT VII-5

USE OF RELATIONAL DBMS BY APPLICATION TYPE

(Percent)

| Application Type | Proportion of Applications | |
|----------------------|----------------------------|------|
| | 1988 | 1989 |
| Management Reporting | 25 | 28 |
| Operations | 25 | 20 |
| Company Specific | 19 | 12 |
| Accounting | 16 | 18 |
| Marketing and Sales | 8 | 14 |
| Technology | 7 | 8 |

E

Electronic Data Interchange

While the mention of Electronic Data Interchange (EDI) appears modest at 4% of the responses, INPUT believes this is quite significant. Implementing EDI is essentially an application development process, which means it is fighting for resource allocation against the overall backlog.

Exhibits VII-6 and VII-7 provide a measure of the EDI activity. The awareness and activity levels have grown significantly over the past two and one-half years.

EDI is often the first step by an organization to develop interorganizational systems. It takes time, cooperation, and a desire to conduct business differently to gain the rewards that those who have led the way are already enjoying.

EXHIBIT VII-6

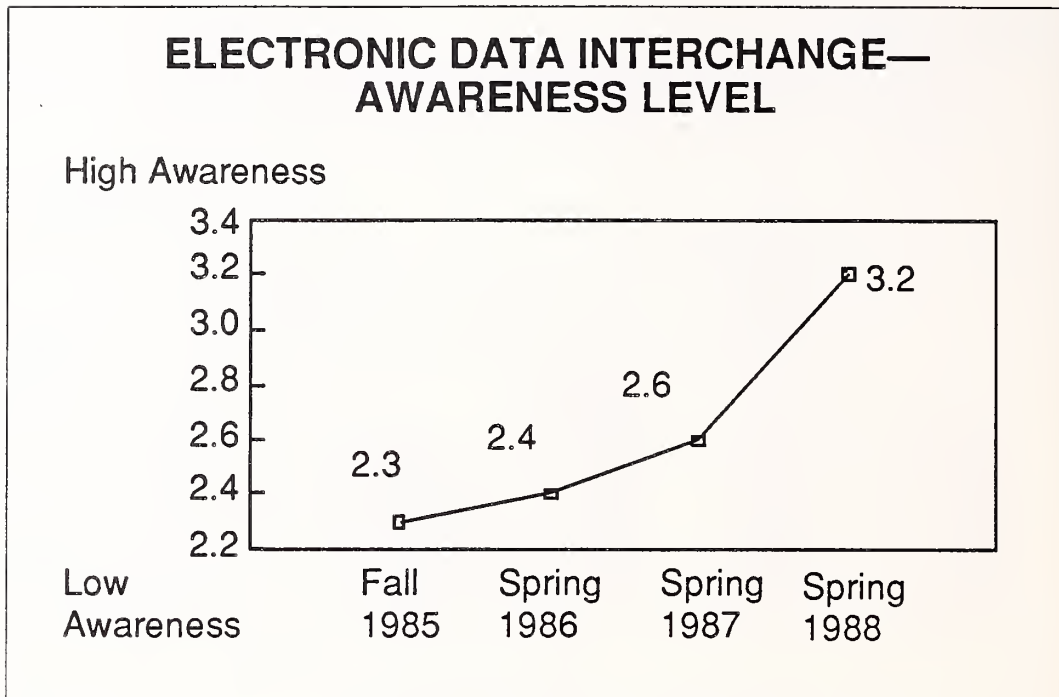
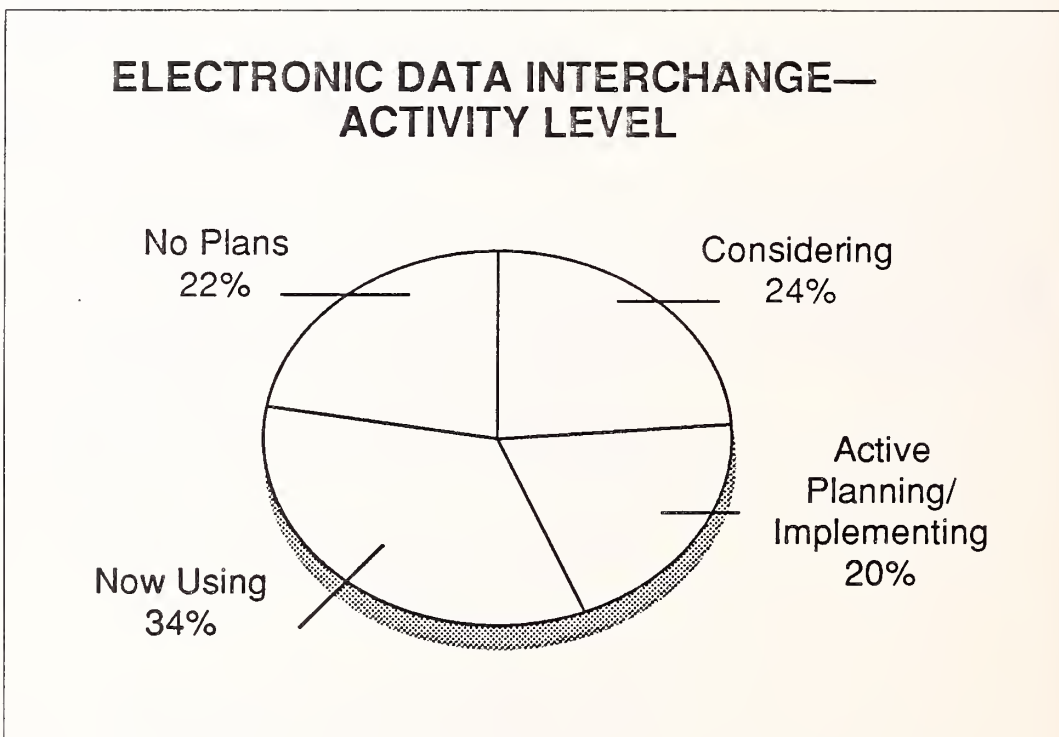
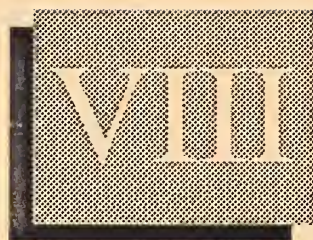


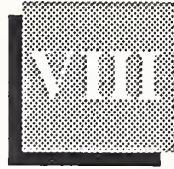
EXHIBIT VII-7





Conclusions and Recommendations





Conclusions and Recommendations

A

Conclusions

INPUT has “boiled” all of the findings in this research down to the following few conclusions. There are certainly more issues to be concerned about, but in line with the belief that IS management must focus its priorities, these are by far the most important.

- There is no stopping the increasingly strategic focus on the central IS organization. Management at the senior level and those directing operating levels simply expect information technology to keep their businesses competitive. If IS cannot respond they look elsewhere.
- The shift in control of the information technology budget from Corporate IS to the operating units and user departments continues. To an ever-increasing extent IS will monitor, versus control, these expenditures through policy and review.
- Addressing the applications development backlog continues as a never-ending problem. While CASE technology offers one solution, the more apparent and important trend is the use of external products and services to provide solutions.
 - The end user is a direct factor in the growing use of external resources and it is in the end user's budget where the expenditures lie.
 - The Systems Integration phenomenon is a direct evolution of the search for “solutions” versus applications, with a greatly increased responsiveness.
- The end-user knowledge base is expanding rapidly. The growth of departmental computing, personal computers becoming intelligent workstations, and the end user developing production systems all indicate that the next stage of end user involvement has begun. The support levels and impact on priorities must be positioned in this light.

- The technology explosion is at the heart of IS problems and opportunities. There are many ways to tackle a solution, most of which will work. If the central IS organization does not structure an architecture that balances flexibility, standards, and connectivity, the heterogeneous environments of the 1980s will not become the integrated environment of the 1990s.
- A cooperative environment between central IS, operating unit IS, and user departments is the fundamental element to a successful information systems program in today's complex organization. This responsibility falls directly on the central IS organization and the senior IS executive.

B

Recommendations

INPUT recommends the following priorities for Information Systems management for 1989 and the early 1990s.

1. Information Systems Priorities for 1989

Exhibit VIII-1 provides a set of specific objectives that INPUT recommends be included in the Information Systems 1989 business plans. They are internal in their focus and are designed to gather the intelligence required to support the longer range priorities recommended in section 2 below.

- Conduct an audit of your data management function.
 - Is it prepared to handle the dynamics of relational data base technology versus that of conventional DBMS environments?
 - Are there management processes, policies, and procedures in place to support data administration on a decentralized basis?
 - What is the performance rating of the data management group by those served (its customers)?
 - Is there clarity of the charter of data management on a company-wide basis?
- Take a fresh look at how the IS budget is monitored. Is there adequate knowledge of the total expenditure level and are the control policies up to date?
- Review the current use of external resources for application development.
 - Are you still buying programmers or true solutions or are you looking to the outside for new ideas?

EXHIBIT VIII-1

**INFORMATION SYSTEMS PRIORITIES
1989**

- Audit the Data Management Function
- Review IS Budget Control Policies
- Review How External Products and Services Are Being Used
- Audit the IS Training Program against Future Priorities
- Prepare the End User Support Group for the Next Wave
- Experiment with Connectivity of Heterogeneous Platforms
- Assign Specific Responsibility for Monitoring Industry Standards

- Is the focus on packaged software adequate?
- Are the necessary monitoring processes in place?
- Audit your IS training program. What may have been adequate in the past is certainly not adequate for the IS environment of the future.
- Take a fresh look at the end user support program. The information center in its original definition is quickly becoming inadequate. Are you ready for the impact of all those PCs becoming intelligent workstations?
- Set some very specific connectivity objectives for 1989. If your information network includes heterogeneous platforms, as most do today, then it's time to be experimenting with the growing number of connectivity products that support true connectivity/integration.
- Be sure someone is assigned the task of monitoring the diverse, important standards activity within the industry.

These priorities must be blended with the objectives of treating users as customers, doing solid planning, and running the “business” day-to-day. In Chapter III it was suggested IS “think like an operating unit.” The priority tasks in Exhibit VIII-1 are intended to help achieve this focus.

2. Information Systems Priorities beyond 1989

The longer range priorities that INPUT recommends to Information Systems management are listed in Exhibit VIII-2 and are discussed below.

EXHIBIT VIII-2

INFORMATION SYSTEMS PRIORITIES BEYOND 1989

- Set and Communicate Clear Expectations for the IS Program
- Identify the True Mission-Critical Processes
- Build an Application Development Environment That Supports Use of All Resource Sources
- Refocus Data Management to a Company-Wide Orientation
- Monitor IS Programs of the Competition
- Build a Technology Plan Acceptable to Management
- Reorient Central IS to a Consulting Role

- Work with management to assure that clearly defined expectations are set and then communicate them to the entire IS organization. Set up an IS management environment that measures performance as an operating unit, not a staff group (e.g., measure your data center performance as a manufacturing plant and conduct customer satisfaction surveys).
- Implement a process to work with operating management to identify and assess those mission-critical operations. Without this in hand it is impossible to address how information technology can support these aspects of the business.

- Build an application acquisition environment that considers and takes advantage of all development resource alternatives. Include central and operating unit information systems staffs, the end user, and external sources. IS must look everywhere for new ideas and solutions.
- Expand the orientation and strengthen the Data Management process within the central IS organization. IS must provide the defined infrastructure for the truly integrated information network of the 1990s.
- Establish responsibility for monitoring the information systems programs of competitors and potential competitors.
- Build a technology/network plan that is understood and supported by management. It is the only way the network will become integrated.
- Build a central IS organization that deals with network management and the infrastructure of the information systems process and acts as a strategic opportunist.
 - Continue (or begin) the shift of day-to-day responsibility toward the decentralized IS function and/or the end user.
 - Revise the IS training program to increase the emphasis on consulting and business skills.

INPUT strongly believes that the central IS organization of tomorrow's complex organization will be much different than that of the 1980s. The end user and his local support team will have assumed responsibility for day-to-day activities such as processing and maintenance, and will be doing a majority of the local application development.

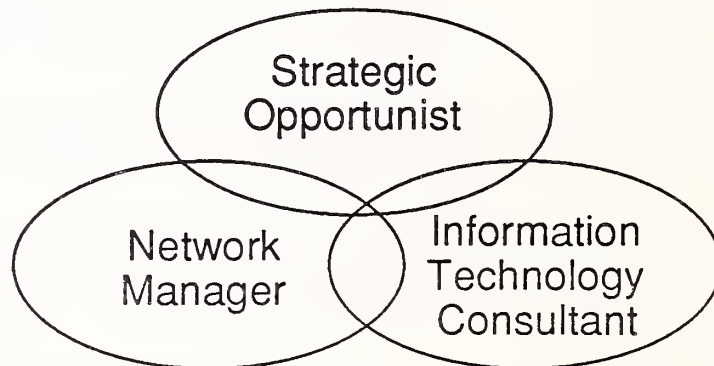
The central IS organization must fulfill three critical roles. Two are supportive in nature and one is operational.

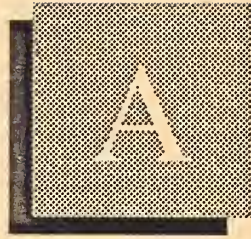
1. The operational role will be that of the *Network Manager* operating the central data centers and the networks, but not tiers two and three.
2. The first supportive role will be that of the *Infrastructure Manager*, where central IS will provide the framework for decentralized applications development, the policies for technology acquisition, and the senior consulting resources to support major plans of the operating units and their local IS support teams.
3. The second supportive role will be that of *Strategic Opportunists*, where central IS serves the organization as a whole, providing overall and specific support for the use of information technology in the advancement of the business as opposed to the historical support of operations.

The role that INPUT believes the IS executive must play in the 1990s is shown in Exhibit VIII-3. Only the progressive IS executives will make the necessary transition in the first half of the 1990s. Those that do will have served their organizations in the best way they can.

EXHIBIT VIII-3

INFORMATION SYSTEMS EXECUTIVE'S ROLE IN THE 1990s





Planning Report Budget and Issue Questionnaire

CONFIDENTIAL**INPUT****Information Systems Program
1988 Annual Planning Report Budget and Issue
Questionnaire****Individual completing the questionnaire:**

Date _____
 Name _____
 Title _____
 Address _____
 Phone Number _____

I Organization

First a few questions about your organization.

1. Name of the company/organization? _____

2. Industry sector? (Please check one).

- | | | |
|---|--|--|
| <input type="checkbox"/> Discrete Mfg | <input type="checkbox"/> Distribution | <input type="checkbox"/> Services |
| <input type="checkbox"/> Process Mfg | <input type="checkbox"/> Banking & Fin | <input type="checkbox"/> Federal Gov |
| <input type="checkbox"/> Transportation | <input type="checkbox"/> Insurance | <input type="checkbox"/> State/Loc Gov |
| <input type="checkbox"/> Utilities | <input type="checkbox"/> Medical | <input type="checkbox"/> Other |
| <input type="checkbox"/> Telecommcat'n | <input type="checkbox"/> Education | |

3. 1987 sales _____ millions?

4. Is your location the company's:

- ☐ Headquarters
- ☐ Subsidiary (Parent Co Name _____)
 (1987 sales of Parent _____)
- ☐ Operating Division
- ☐ Other (specify _____)

5. Number of employees? _____

Company _____

Subsidiary _____

II IS Organization

Next, a few specifics about your IS operations.

1a. How many employees are in the IS function?

1987 _____ 1988 plan _____ 1989 est _____

1b. Is this the total number of IS staff for the company?

Yes ☐ No ☐

If No please estimate the total? _____

1c. Is the IS organization centralized or decentralized?

Centralized ☐ Decentralized ☐

1d. If decentralized please indicate the number of IS organizations by the following categories?

Corporate Departments ☐

Operating Divisions ☐

Subsidiaries ☐

2a. By what percentage do you expect the corporate IS staff to change in 1989?
(+/-) _____ %

2b. By what percentage do you expect your division or subsidiary IS staff to change in 1989? (+/-) _____ %

3. Estimate the percentage of the IS staff in each of the following categories and the percentage it is projected to change during 1988?

| Category | <u>1987</u> % Total | <u>1988 % Change</u> | | |
|--------------------|------------------------|----------------------|------------|--------------|
| | | Incr +% | Decr -% | No Change |
| Development | _____ | _____ | _____ | _____ |
| End User Computing | _____ | _____ | _____ | _____ |
| Data Management | _____ | _____ | _____ | _____ |
| Operations | _____ | _____ | _____ | _____ |
| Technical Support | _____ | _____ | _____ | _____ |
| Other (_____) | _____ | _____ | _____ | _____ |
| Total | 100% | | | |

4a. Do any end user departments have their own IS staffs?
Yes ☐ No ☐

4b. If yes, which ones? _____

5a. Does IS have responsibility for voice communications?
Yes ☐ No ☐

5b. How many employees are in the telecommunications function? _____

III IS Budget

Now a group of questions on the IS budget.

1a. What is the total amount of your company's (or location's) IS budget (\$000) and how is it projected to change?

| 1987 | 1988plan | 1989est | Growth 88-89 |
|-------|----------|---------|--------------|
| _____ | _____ | _____ | _____ % |

1b. Are computing expenses of subsidiaries and divisions included ?
Yes ☐ No ☐

1b.1 If yes, what percent is for subsidiaries and divisions? _____ %

1b.2 If no, what is the estimated size of 1988 budgets not included?
\$ _____

1c. Does the IS budget include computing expenses of user departments?
Yes ☐ No ☐

1c.1 If yes, what percent is for user departments? _____ %

1c.2 If no, what is the estimated size of 1988 end user computing budgets not included? \$ _____

2. What three factors most impacted your budget for 1988?

2.1 _____
2.2 _____
2.3 _____

3. What three factors are expected to most affect your 1989 budget?

3.1 _____
3.2 _____
3.3 _____

4. What are the annual expenses in your 1987 and 1988 budgets for the following categories? And what are the anticipated changes for the 1989 budget:
% increase(+) or decrease(-)?

Note: Enter either dollars (\$000) or percentage of total budget in columns 4a and 4b.

| Categories | 4a. 1987 (\$000) or % | 4b. 1988 (\$000) or % | 4c. 1989 % Change |
|--|--------------------------------|--------------------------------|-------------------------|
| Personnel (Salaries & Fringes) | _____ | _____ | _____ |
| Computer Hardware | | | |
| Mainframes (>\$350K)* | _____ | _____ | _____ |
| Minicomputers (\$15K-350K)* | _____ | _____ | _____ |
| Micros (<\$15K)* | _____ | _____ | _____ |
| Mass Storage Devices | _____ | _____ | _____ |
| Other | _____ | _____ | _____ |
| Total Hardware | _____ | _____ | _____ |
| Communications | | | |
| Data Communications | _____ | _____ | _____ |
| Voice Communications (if managed by IS) | _____ | _____ | _____ |
| Total | _____ | _____ | _____ |
| External Products/Services | | | |
| Professional Services | _____ | _____ | _____ |
| Processing Services | _____ | _____ | _____ |
| Application Software | _____ | _____ | _____ |
| Systems Software | _____ | _____ | _____ |
| Turnkey Systems | _____ | _____ | _____ |
| Hardware Maintenance | _____ | _____ | _____ |
| Software Maintenance | _____ | _____ | _____ |
| Other External | _____ | _____ | _____ |
| Other | _____ | _____ | _____ |
| Total | _____ | _____ | _____ |

* Hardware purchase price

IV Application Development

This group of questions looks at the use of application development resources.

1. How many employees are in your applications development function? _____

2. What percent of applications development staff are assigned to:

| | |
|------------------------------|---------|
| Developing new systems | _____ % |
| Maintaining existing systems | _____ % |
| Enhancing existing systems | _____ % |
| Total | 100% |

3a. Of your major development projects what percentage will be done using?

| | |
|--------------------------|---------|
| Internal resources | _____ % |
| External resources | _____ % |
| Combination of resources | _____ % |

3b. What percentage will be done using?

| | |
|--------------------|---------|
| Package software | _____ % |
| Custom Development | _____ % |

4a. Are end users developing their own production (versus personal productivity) applications and on what type of computer(s)?

Yes ☐ No ☐

Mainframe ☐ Mini ☐ PC ☐

4b. What percentage of the total application development is being done by end users? _____ %

5. Over the past year has your application development backlog increased, decreased or remained the same?

| | |
|-------------------|--------------------------|
| Increased | <input type="checkbox"/> |
| Decreased | <input type="checkbox"/> |
| Remained the same | <input type="checkbox"/> |

V. Electronic Data Interchange

INPUT would like to know if your firm is actively addressing Electronic Data Interchange.

1. On a scale of 1 to 5, with five being high awareness, how would you RATE YOUR PERSONAL KNOWLEDGE OF Electronic Data Interchange (EDI), from a strategic standpoint; that is what EDI does?

1 2 3 4 5 (circle one)

2. Next, are you currently using or planning to use EDI?

- ☐ Just beginning to consider EDI
- ☐ Actively planning or implementing an EDI project
- ☐ Now using an EDI application
- ☐ Have no plans for EDI

3. If you are using EDI, please give an example of an active application.

1 _____

VI IS Issues

The last questions concern the issues facing your IS organization in 1988 and beyond.

1. What have been the most significant recent developments within your industry that have, or will, affect your IS department?

1.1 _____

1.2 _____

1.3 _____

2. How is information technology being used to give either your company (or your competitors) a competitive advantage?

2.1 _____

2.2 _____

2.3 _____

3. What new computing technologies can be used in your industry?

3.1 _____

3.2 _____

3.3 _____

4. What needs of your organization are not being satisfied by the vendors?

4.1 _____

4.2 _____

4.3 _____

5. Please list your most important strategic, tactical and operational IS issues. Include comments.

5a. Strategic Issues
(3-5 years or longer)

Comments

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

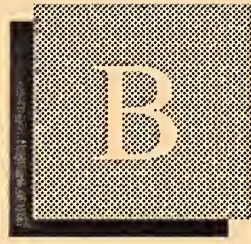
5b. Tactical (2-3 years)

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

5c. Operational (Current year)

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Thank you for your participation. The questionnaire should be returned by March 21, 1988. Please be sure you completed the name and address section so we can send you the synopsis of the research findings.



Application Development Questionnaire



CONFIDENTIAL

UASVA____-1

INPUT

Information Systems Program
1988 Annual Planning Report
Application Development
Questionnaire

INTRODUCTION

A. Hello, my name is _____. I am calling for INPUT a leading market research firm specializing in the information systems industry. I would like to speak to the individual responsible for the applications development function. Would you be the appropriate individual to respond to a questionnaire on this area? It should take only 10 minutes, and INPUT will be pleased to share a summary of the results with you. **If switched elsewhere for referral, repeat as necessary; OTHERWISE GO TO C.**

B. Hello my name is _____. I understand you are responsible for the information systems application development function. I am calling for INPUT a leading market research firm specializing in the information systems industry and would like to ask you a few questions.

Would you or an associate have a few moments now, or would you prefer that we set an appointment for another time? It should take only 10 minutes, and INPUT will be pleased to share a summary of the results with you. **If the correct person proceed to C or make an appointment to call back, otherwise transfer and repeat.**

C. We are currently studying a number of issues in the applications development area, in particular the issue of development productivity. Your responses to the questions will be kept confidential and, as I mentioned, INPUT will send you a complimentary summary of the results.

Individual completing the Questionnaire

Name _____
Title _____
Organization _____
Address _____

Telephone _____

UASVA____-3

The first group of questions will help us understand your application development organization.

1. What is the total number of people in:
 - 1a. Information Systems (company wide)? _____
 - 1b. Applications Development (company wide)? _____
- 2a. Is the development staff centralized or decentralized?
 Centralized____ GO TO 3 Decentralized _____
- 2b. **If decentralized ASK** Please estimate the percent of the development staff in the following categories? **PROBE FOR A GUESS**

| | |
|--------------------------|--------|
| Corp Information Systems | _____% |
| Corporate Departments | _____% |
| Operating Divisions | _____% |
| Subsidiaries | _____% |
| Total | 100% |
3. What percent of applications development staff is assigned to: **PROBE FOR A GUESS.**

| | |
|------------------------------|--------|
| Developing new systems | _____% |
| Maintaining existing systems | _____% |
| Enhancing existing systems | _____% |
| Total | 100% |

The next group of questions look at your applications development backlog and major project plans.

- 4a. Over the past year, has your application backlog increased, decreased, or remained the same?
 - ___ Increased **GO TO 4b**
 - ___ Remained the Same **GO TO 4b**
 - ___ Decreased **GO TO 4c**

UASVA____-4

4b. **If Increased or Remained the Same ASK** What are the major constraints on your firm's ability to reduce the application backlog? For example, a decision to replace all manufacturing systems.

1. _____

2. _____

3. _____

4c. **If Decreased ASK** What are the major factors which enabled you to reduce the backlog? For example, using a 4th generation language.

1. _____

2. _____

3. _____

5. Using the table below ask the following questions:

5a. During the next 12 months, what are the most important application development projects? **PROBE FOR AT LEAST THREE EXAMPLES.**

For each project (application) mentioned in 5a ask:

5b. What type of resources will be used: internal staff, external professional services, or combination?

5c. Will you purchase the system?

5d. What is the estimated total development cost?

| 5a Application | 5b Dev. Resource | | | 5c Soft Pkg | 5d Cost (\$000) |
|-------------------|---------------------|-------|-------|-------------------|-----------------------|
| | Int | Ext | Comb | | |
| _____ | _____ | _____ | _____ | Y N | _____ |
| _____ | _____ | _____ | _____ | Y N | _____ |
| _____ | _____ | _____ | _____ | Y N | _____ |
| _____ | _____ | _____ | _____ | Y N | _____ |

UASVA____-5

6a. Now for all of your major development projects please estimate the percentage that will be done using internal, external or a combination of resources:

6a.1 Internal resources _____ %
6a.2 External resources _____ %
6a.3 Combination of resources _____ %

6b. And what percentage will be done using purchased software versus custom development:

6b.1 Purchased software _____ %
6b.2 Custom development _____ %

6c. You indicated that you will do about _____ % (INSERT RESPONSE TO 6a.2) of your new applications development with external, that is, professional services resources. Is this more, the same or less external support than in 1987?

More _____
Same _____
Less _____

The next group of questions address productivity within the corporate or central application development organization.

7a. What are the top 3 issues concerning application development within your firm? If productivity mentioned go to 7c.

1. _____
2. _____
3. _____

7b. You did not mention application development productivity, is it a critical issue?
Yes _____ No _____ GO TO 8

10a. Are Fourth Generation languages used?

Yes ____ No ____ **GO TO 10d**

10b. If Yes ASK Which ones? **READ LIST**

Focus ____ Ideal ____
 Ramis ____ Cognos ____
 Mantis ____ Other ____ (specify) ____
 Natural ____

10c. Please provide examples of how your firm uses 4th generation languages? For example, prototyping or report generation. **PROBE FOR 3 EXAMPLES**

10c.1 _____

10c.2 _____

10c.3 _____ **GO TO 11a**

10d. If No ASK Why not? _____

11a. Are any Computer Assisted Software Engineering (CASE) tools in use?

Yes ____ No ____ **GO TO 11e**

11b. If Yes ASK Which ones? **READ LIST AS PRODUCT NAME FROM VENDOR NAME**

____ Product (Vendor)
 ____ Excelerator (Index Technology)
 ____ Application Factory (Cortex)
 ____ APS Development Center (Sage Software)
 ____ Prokit Workbench (McDonnell Douglas)
 ____ Foundation (Arthur Anderson)
 ____ Information Engineering Workbench (KnowledgeWare)
 ____ Analyst/Designer Toolkit (Yourdon)
 ____ Telon (Pansophic)
 ____ Other (specify) _____

11c. What are the strengths of these tools?

UASVA____-8

11d. What are the weaknesses of these tools?

_____**GO TO 11f**

11e. **If No ASK** Are any under consideration?

Yes ____ No ____ **GO TO 12**

11f. **If yes ASK** Which ones?

12. Is there an organized project addressing application development productivity? Yes____ No____
GO TO 14a

13. **If Yes ASK** Please provide the name of the Development Manager or project leader who might participate in a more in depth interview.

Name _____
Title _____
Phone No. _____

The final group of questions asks about the involvement of the end user in application development at your firm.

14a. Does your firm have an information center; that is, a group that is directly responsible for end user computing?
Yes ____ NO ____ **GO TO 15**

14b. How many Information Centers are there? _____

14c. Do the Information Centers report to: **READ LIST**

| | | |
|-------------------------|---|---|
| 1. Information Systems? | Y | N |
| 2. User Departments? | Y | N |
| 3. Operating Divisions? | Y | N |
| 4. Subsidiaries? | Y | N |

15a. Are end users developing their own production applications or is their development limited to personal productivity programs? For example a departmental project control system would be a production system while analyzing a specific project with Lotus 1-2-3 would be a personal productivity application. **READ LIST**

All Production ____ Some Prod. ____ Personal Only ____ **GO TO 16**

15b. On which type of computer(s) are the production systems being developed?

Mainframe ____ Mini ____ PC ____

UASVA____-9

15c. Please provide examples of user developed production applications?

15c.1 _____

15c.2 _____

15c.3 _____

16. Now, estimate the percentage of all new application development that is being done by end users?
PROBE FOR A GUESS _____%

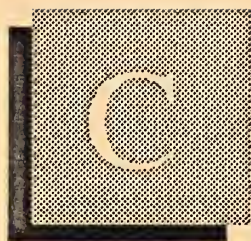
17. INPUT will also be researching trends in data administration during 1988. Would you provide us with the name of the manager of your data administration (management) department?

Name _____

Title _____

Phone No. _____

That's it! I want to thank you for your help today. Let me double check your address in order to send you a synopsis of the report. Thanks again.



Data Administration Questionnaire



CONFIDENTIAL

UASVD____-1

INPUT**Information Systems Program
1988 Annual Planning Report
Data Administration
Questionnaire****INTRODUCTION**

A. Hello, my name is _____. I am calling for INPUT a leading market research firm specializing in the information systems industry. I would like to speak to the individual responsible for the data administration function (that is; the Data Base Administrator, or Manager of Data Administration or Data Management). Could you direct me to that individual? **If switched elsewhere for referral, repeat as necessary.**

B. Hello, my name is _____. I understand you are responsible for the data administration (or data management) function. I am calling for INPUT a leading market research firm specializing in the information systems industry and would like to ask you a few questions.

Would you have a few moments now, or would you prefer that we set an appointment for another time? It should take only 10 minutes and INPUT will be pleased to share a summary of the results with you. **If the correct person proceed to C or make an appointment to call back, otherwise transfer and repeat.**

C. We are currently studying a number of issues in the data administration area of information systems, in particular the use of relational data base management systems and the use of data dictionaries. Your responses to the questions will be kept confidential and, as I mentioned, INPUT will send you a complimentary summary of the results.

Individual completing the Questionnaire

Name _____
Title _____
Organization _____
Address _____
Telephone _____

UASVD____-3

The first group of questions address the data administration organization.

- 1a. What is the number of employees in the data administration staff?
 1987 _____ 1988 plan _____ 1989 estimate _____
- 1b. Is there more than one Data Administration organization?
 Yes ____ No ____ **GO TO 2**
- 1c. How many separate data administration organizations are there within your firm? _____
- 1d. Please describe each one?

Data Administration Org

Reports To

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

- 1e. Which of the following categories of data is the corporate data administration function responsible for? **READ THE LIST**

| | | |
|-------------------------|---|---|
| Central Data | Y | N |
| Division Data | Y | N |
| Departmental Data | Y | N |
| Distributed Systems | Y | N |
| Minicomputer Data Bases | Y | N |
| PC Data Bases | Y | N |
| Non Data Base Systems | Y | N |
| Other (_____) | Y | N |

- 1f. How have these responsibilities changed in the past year?

- 1g. What are the top 3 issues facing your data administration function?

1g.1 _____

1g.2 _____

1g.3 _____

UASVD____-4

- 1h. On a scale of 1 to 5 how would you rate the effectiveness of the corporate data administration function today? Five indicates excellent performance and one poor performance.

1 _____ Poor
 2 _____
 3 _____ Average
 4 _____
 5 _____ Excellent

Next, I would like to learn which data base management systems (that is DBMSs) are in use, and what the primary applications are for each, for mainframes, minis and personal computers.

- 2a. First, what DBMSs are in use on your mainframe(s)?

| | DBMS | Primary Use/Applications |
|------|-------|--------------------------|
| 2a.1 | _____ | _____ |
| 2a.2 | _____ | _____ |
| 2a.3 | _____ | _____ |

- 2b. Next, minicomputers?

| | | |
|------|-------|-------|
| 2b.1 | _____ | _____ |
| 2b.2 | _____ | _____ |
| 2b.3 | _____ | _____ |

- 2c. And finally personal computers?

| | | |
|------|-------|-------|
| 2c.1 | _____ | _____ |
| 2c.2 | _____ | _____ |
| 2c.3 | _____ | _____ |

- 2d. Are any new DBMS's under consideration?

Yes ____ No ____ **GO TO 3**

- 2e. Which ones and for what applications?

| DBMS | Applications |
|-------|--------------|
| _____ | _____ |
| _____ | _____ |

The third set of questions address your use of relational data base management systems.

3. Has your organization developed any relational DBMS based applications?
Yes ____ No ____ GO TO 5

4. Using the following table ask:

- 4a. What applications have been developed using a relational DBMS? TRY FOR MORE THAN 1
EXAMPLE

FOR EACH APPLICATION MENTIONED IN 4a ASK:

- 4b. What relational DBMS was used?
4c. What computer (mainframe, mini or PC) was used?
4d. When were they developed?

| 4a | 4b | 4c | 4d |
|------------------|------------|-------------------|----------------|
| Application Name | RDBMS Used | M/F Mini PC | When Developed |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

5. Using the following table ask:

- 5a. What applications are planned for development using a relational DBMS in the next two years?
TRY FOR MORE THAN 1 EXAMPLE

FOR EACH APPLICATION MENTIONED IN 5a ASK:

- 5b. What relational DBMS will be used?
5c. What computer (mainframe, mini, or PC) will be used?
5d. When will they be developed?

| 5a | 5b | 5c | 5d |
|------------------|------------|-------------------|----------------|
| Application Name | RDBMS Used | M/F Mini PC | When Developed |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

UASVD____-6

6. Of all new application development projects, what percentage would you estimate will be done using a relational DBMS in 1988 and 1989? Please indicate by type of computer. **PROBE FOR A GUESS.**

Percent of All New Development

| | 1988% | 1989% |
|-----------|-------|-------|
| Mainframe | ____% | ____% |
| Mini | ____% | ____% |
| PC | ____% | ____% |
| Total | 100% | 100% |

Now, I would like to ask about the involvement of the end user in application development.

7. Are end users developing applications using relational DBMS systems?
YES ____ No ____ **GO TO 10**

8. **USING THE FOLLOWING TABLE ASK:**

- 8a. What applications have been developed by end users with a relational DBMS? **TRY FOR MORE THAN 1 EXAMPLE**

FOR EACH APPLICATION MENTIONED IN 8a ASK:

- 8b. What relational DBMS was used?

- 8c. What computer (mainframe, mini or PC) was used?

- 8d. When were they developed?

| 8a Application Name | 8b RDBMS Used | 8c M/F Mini PC | 8d When Developed |
|------------------------|------------------|-------------------------|----------------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

UASVD____-7

9. What criteria was used to determine that end users were equipped to do their own relational DBMS based development?
-

The next few questions concern your use of distributed data base management systems.

10. **IF NO TO 7 ASK** Are you familiar with distributed data base management system concepts?
Yes ____ No ____
11. Is Distributed Data Base Management Systems (DDBMS) technology in use within your firm?
Yes ____ No ____ **GO TO 13**
12. **USING THE FOLLOWING TABLE ASK:**

- 12a. What applications have been developed using a distributed DBMS? **TRY FOR MORE THAN 1 EXAMPLE**

FOR EACH APPLICATION MENTIONED IN 12a ASK:

- 12b. What distributed DBMS was used?
- 12c. What computer (mainframe, mini or PC) was used?
- 12d. When were they developed?

| 12a Application Name | 12b DDBMS Used | 12c M/F Mini PC | 12d When Developed |
|-------------------------|-------------------|--------------------------|-----------------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

GO TO 14

13. **If No TO 11 ASK** Is distributed DBMS under consideration?
Yes ____ No ____ **GO TO 15a**

14. USING THE FOLLOWING TABLE ASK:

14a. What applications are under consideration that will be developed using a distributed DBMS? **TRY FOR MORE THAN 1 EXAMPLE**

FOR EACH APPLICATION MENTIONED IN 14a ASK:

14b. What distributed DBMS was used?

14c. What computer (mainframe, mini or PC) was used?

14d. When will they be developed?

| 14a Application Name | 14b DDBMS Used | 14c M/F Mini PC | 14d When Developed |
|-------------------------|-------------------|--------------------------|-----------------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

The last few questions address your use of data dictionaries.

15a. Does your firm use a data dictionary?
Yes ____ No ____ **GO TO 16a**

15b. What data dictionaries are in use and what data bases do they cover?

| Data Dictionary | Data Bases Covered |
|-----------------|--------------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

16a. Please estimate the percentage of your data bases that are administered using a data dictionary?
____%

UASVD____-9

16b. How would you rate the quality of your use of these data dictionary capabilities?

- ____ Excellent
- ____ Above Average
- ____ Average
- ____ Below Average
- ____ Unsatisfactory

17a. Are you planning to install a data dictionary?

Yes ____ GO TO 18 No ____

17b. If No, why not? _____

____ GO TO 19

18. USING THE TABLE BELOW PLEASE ASK THE FOLLOWING QUESTIONS:

18a. What data dictionaries are planned?

FOR EACH DATA DICTIONARY MENTIONED IN 18a ASK:

18b. When do you plan to implement these dictionaries?

18c. What data bases will they cover?

18a.
Data Dictionary

18b. When
Implement

18c.
Data Bases

19. Finally, would you (or the manager of data administration) be willing to participate in a more in depth interview at a future date? Yes ____ No ____

Name _____
Title _____
Phone No. _____

That's it! I want to thank you for your help today. Let me double check your address in order to send you a synopsis of the report. Thanks again.

